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Issue Article

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FEATURES OF SOCIO-ECONOMIC INDUSTRIAL PROVISIONS CITIES RUSSIAN ARCTIC

Abstract: *In this article, the authors examine the systemic and emerging challenges, risks, and opportunities for economic development, including sustainable development, in the Russian Arctic. An analysis of the characteristics, trends, and prospects for industrial production in the Russian Arctic is provided, revealing the problems and specific features of its operation. single-industry towns. Installed readiness The Russian Arctic regions are working to overcome current economic instability from a labor market perspective. The problems and prospects for creating conditions for the integrated use of raw materials in Arctic regions are examined and substantiated. The conditions and prospects for shift work transformation as a means of changing migration trends and developing the Arctic labor market are identified.*

Key words: *current issues, investment projects, global recessions, geopolitical processes, problems of increased costs, socio-economic processes, Arctic zones, economy of the Arctic Zone of the Russian Federation regions.*

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Introduction

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These facts confirm significance chosen ones us wide the context of the study of the development of the Russian Arctic not only from the standpoint of achieving the economic indicators of specific enterprises and target indicators for the development of the Arctic established at the regional and national levels, but it is precisely in the context of movement

within the framework of a global strategy for the development of the oil and gas, mining, and metallurgical businesses, taking into account risks, possibilities, a also new roles V public stabilization in the context of the COVID-19 pandemic and rising geopolitical tensions. This broad context naturally highlights the scale of new challenges that must be addressed, namely:

- on the one hand, updating the risks and opportunities for greening production and social responsibility for enterprises in the Arctic Zone of the Russian Federation;
- on the other hand, the supporting role of the state as a regulator conditions for development business initiatives private sector V the Arctic is intensifying possibilities development and influence business on socio-economic processes, but simultaneously forms restrictions development business, necessity provision complex measures security — epidemiological and environmental,
- on the third hand, the need to achieve strategic development goals Arctic Zone of the Russian Federation, fixed V complex strategic indicators development of the Arctic Zone of the Russian Federation, including demographic ones, the probability of achieving which we justify as low (the main target indicators are reflected in the Arctic Zone Development Strategy, the Program of the Russian Federation “Socio-Economic Development of the Arctic Zone of the Russian Federation”. With taking into account the above us was ahead to decide first, namely: to find out the conditions for sustainable development of the Russian Arctic:

to identify the problems and specific features of the functioning of single-industry towns in the Russian Arctic.

In the old industrial cities of the Russian Arctic regions — the Komi Republic, Krasnoyarsk Krai and Murmansk Oblast — the historically developed concentration of industrial sectors has determined the corresponding economic, social and spatial structure of single-industry settlements. The city of Vorkuta (Komi Republic), founded in 1943 on the basis of several settlements, developed as a coal mining center: in 1931, the construction of the settlement Rudnik (which later became the city of Vorkuta) began; in 1932 — the construction of two mines; in 1933 — the construction of a narrow-gauge railway between the mines and the pier of the Pechora Shipping Company; in 1934, the first echelon of coal was dispatched; in 1940, four new mines were founded; in 1944, the Vorkuta Mechanical Plant began operating; in 1953, 17 mines were already operating; in 1974 the plant Vorkutaugol was transformed V production Vorkutaugol Association; V 1997 G. unification was transformed V open joint-stock company; in 2003, the merger of OJSC Vorkutaugol took place with JSC Severstal V 2022 G. JSC Vorkutaugol entered V compound OOO Russian Energy holding AEON, engaged in large infrastructure projects. Enterprises JSC Vorkutaugol are mastering Pechorsky coal basin — large raw materials base for energy, metallurgical and coke-chemical industry: V compound JSC Vorkutaugol are included four mines, one cut and enrichment factory. B coal in general branch of the economy Vorkuta creates about 80% of the volume industrial production and practically 60 % urban gross product. Peak socio-economic development the city of Vorkuta fell on 1988–1989 gg. with a maximum population of 218.5 thousand people (included in the city-forming enterprise in this period was included 13 mines, a also service enterprises, state farm trusts, enterprises socio-cultural and household appointments.

Main part

Today V compound municipal education "Urban district Vorkuta" includes the city of republican significance Vorkuta, 8 urban-type settlements and 7 rural settlements. The population as of January 1, 2024, was 71,300 people, including 62.3% of the working-age population. Peculiarity national composition population — vital activity of indigenous peoples few in number peoples North Nenets, engaged in reindeer herding and leading nomadic image life. Here located generic community " Tybertya " and the trading posts " Buredan ", "Syr-Yaga", "Zapadnaya", " Balbanty " maintained by the PSC "Olenevod" .

The city of Vorkuta is included in the list of single-industry municipalities Russian Federation (on city-forming enterprise busy 23.5 % average headcount of employees at city enterprises). The current economic situation of the city is characterized by a single-industry economy, subsidies, low potential diversification economy. One of features Vorkuta consists of V volume, what she located V separation from highway and logistics communications: territory cities limited by iron expensive and non-year-round highway. This feature determines the autonomy of the urban economy - spatial detachment from main markets sales products and the closed nature of sales of the main industries to a specific market. The emergence of the city of Norilsk (Krasnoyarsk Krai) is associated with the development of Taimyr deposits of non-ferrous and precious metals: in 1935, a decision was made to build the Norilsk Nickel Plant, in 1939, the camp settlement Norillag received status worker settlement Norilsk, in 1953 G. — status cities. To 1953 G. V G. Norilsk were built necessary urban infrastructure facilities (hospitals, schools, a stadium, clubs, and a cinema). The population of Norilsk was 77,000 people, of which 68,000 were prisoners. "Norillag". In 1989 G. plant entered V compound state concern for the production of non-ferrous metals Norilsk Nickel (the concern also included the Pechenganikel and Severonikel plants, the

Olenegorsk Mechanical factory, Krasnoyarsk factory colored metals And Gipronickel Institute). With 2001 G. enterprise is Polar branch MMC Norilsk Nickel is the largest producer of nickel, palladium and platinum and copper, production units which are located V Russia, Australia, Botswana, Finland and South Africa. Zapolyarny branch PJSC « Mining and metallurgy Norilsk Combine nickel" have to near 70 % urban gross product and about 87% of the industrial output. The products of the city-forming enterprise, providing more than 7% of the metallurgical production Russia, uses sustainable in demand in the domestic and foreign markets. In addition to mining and non-ferrous metallurgy, Norilsk's socio-economic development is determined by the gas industry. And food industry, transport and communication, Housing and communal services, trade and supply activities; the city is completely self-sufficient in energy resources. Today, the municipal formation of the urban district of the city of Norilsk includes the city of Norilsk and the urban settlement of Snezhnogorsk. Closed and remote, Norilsk, accessible by air and water, is the fastest-declining city in the Russian Arctic (as of January 1, 2022). G. number population cities compiled 184.6 thousand person, from them V able-bodied age — 66.8 %). Geographic remoteness from Key transport routes, hubs, and sales markets are the main reasons for complex cargo delivery logistics, high transportation costs, high transport tariffs, rising living costs, and the vulnerability of energy infrastructure. Furthermore, Norilsk is one of the from the most contaminated cities Russian Federation. One of recent environmental disasters G. Norilsk (May 2020 G.) — spill 15 thousand m ^{3} petroleum products V rivers Daldykan and Barn as a result partial destruction tank with diesel fuel on the territory Thermal Power Plant No. 3 of Norilsk -Taimyr energy companies — subsidiary enterprises MMC Norilsk nickel".

City-forming enterprises of Kirovsk (Murmansk region) - Kirovsky branch JSC "Apatite" And JSC "North-West Phosphoric Company (PJSC Acron). The discovery of apatite-nepheline ore deposits on the Kola Peninsula in 1920 served as an impetus for the development of mining and the creation of a mining and chemical plant "Apatite". Simultaneously with construction the city of Khibinogorsk was built around the mine and the processing plant of the plant. In 1929, the Apatit Trust was established, which in 1938 received the status of a state mining and chemical plant "Apatite". With 1930 G. V under construction worker village special settlers and volunteers began to arrive (mostly from the city of Leningrad, before 1938 G. which was administrative center Murmansk district). In 1931 G. began launch first apatite-nepheline factories ANOF-1. IN 1934 The town of Khibinogorsk was renamed Kirovsk. Further development of the apatite-nepheline ore deposits of the Khibiny deposit proceeded in record time; the Central and Vostochny mines were commissioned, near which the settlement of Koashva grew. A third apatite-nepheline processing plant was built and commissioned near the settlement of Titan. In the 1980s, the population of the town and surrounding villages remained stable, in part due to major housing construction in the nearby town of Apatity.

The establishment of the plant gave rise to numerous teams to serve it. Thus, in 1953, due to the emergence of cases of pneumoconiosis among the plant's workers, a departmental unit was created at the plant station by struggle with silicosis, today this scientific medical institution federal subordination "Research" a laboratory for complex hygiene problems with an occupational disease clinic," which is respected in Russia and abroad. Since 2017, the enterprise has been the Kirov branch of JSC Apatit, the largest supplier fertilizers vertically integrated PhosAgro Group compound the group also includes mining and processing enterprises in the Vologda, Saratov, and Leningrad regions, its own logistics infrastructure, two port terminals, and a distribution network for mineral fertilizers and feed phosphates. [41] The Kirov branch of JSC Apatit is the core enterprise of the PhosAgro group, providing the company's production complexes with apatite concentrate for the production of fertilizers in demand on the domestic and international markets. The company is developing six Khibiny deposits: Yuksporskoye, Kukisvumchorrskoye, Apatite Circus, Plateau Rasvumchorr, Koashvinskoe and Nyorkpakhkskoye . In 2024, its processing plants produced more than 10.6 million T apatite and 1.1 million T nepheline concentrate. Number of employees Kirovsky branch JSC "Apatite" together with subsidiaries the branch accounts for 37% of the city's employees. The branch has its own training center, providing vocational training and continuing education in required specialties. Kirovsky branch JSC "Apatite" plays big role in the socio-economic development of the city: the share of tax and non-tax revenues in the total volume of the city budget's own revenues is 56 % (receipts from personal income tax, land tax, rental pay for land, payments for negative impact on the environment). History of JSC North-West Phosphorus Company (NWFC) began in 2008 from the construction of infrastructure facilities for a mining enterprise; V 2012 G. was handed over V exploitation career "Deer Ruchey" and the construction of the first stage of the processing plant was completed; since 2013, shipments of apatite concentrate to Russian chemical enterprises of the Acron Group and third-party consumers began; in 2014, at the industrial site Mining and Processing Plant "Deer Stream" were introduced V exploitation main and auxiliary facilities; in 2018, ore mining began from the underground mine And was

introduced V exploitation new railway branch, connecting the mining and processing plant "Deer Stream" With basic network. On today's day subsidiary PJSC company Akron JSC SZFK fully provides needs Russian enterprises groups Akron V phosphate raw materials. Number of people the number of employees of JSC SZFK is 2.1 thousand people. Kirovsk — administrative center municipal education G. Kirovsk, V compound whom also are included villages Titanium and Koashva. The settlements of the urban district are located 25 km away from the main transport highways of the Murmansk region and occupy a dead-end position in the system of main regional transport links. The population of the municipality education makes up 27.7 thousand person, V volume number 58.1 % — of working age. A special legal regime for entrepreneurial activity has been established in the city of Kirovsk in order to ensure accelerated socio-economic development and the formation of a favorable investment climate And creation comfortable conditions for ensuring life support. Residents of the Kirovsk Priority Social and Economic Development Area include repair and maintenance centers, a workshop for equipment repair for major mining enterprises in the region, and tourist complexes.

The city of Kirovsk has a unique natural landscape: the Khibiny Mountains have an average height, comfortable for mountain skis and others species sports. He has traditions active rest and sports, extreme and adventure tourism, skiing season here is one from most long-term among similar resorts. Popularity uses summer tourism V Khibiny mountains (pedestrian, bicycle, water tours and etc.). Besides this, territory cities covers national Khibiny Park, within the boundaries of which unique geo- , hydro-, zoological, botanical, complex landscape and historical and cultural objects, representing cognitive and aesthetic value. Appearance G. Monchegorsk connected with development copper-nickel deposits. In 1932 G. on state level was accepted decision on complex research Zaimandrovsky district, at trust "Apatite" was created Bureau by development Monche -tundra, approved plan construction of populated areas point. In 1933 G. V composition trust "Apatite" was the directorate was created Severonikel, V 1934 G. — accepted solution O creation Severonikel plant. In 1935, with the issuance of the Resolution of the Bureau of the Leningrad Regional Committee of the All-Union Communist Party (Bolsheviks) on the construction of a nickel-copper plant on the Kola Peninsula in the Monche -tundra, the creation of Severonikel began. Construction was underway three mines, enrichment factories, metallurgical and a smelting plant, a refinery, housing and communal facilities for placements and service 25 thousand workers and general population size V 75 thousand person, broad-gauge railway branches For connection with Kirov highway. IN 1935 G. from populated point Moncha -Guba was educated worker village Monchegorsk. In 1937 G. organized camp department for the construction of a nickel plant. In the same year, the village of Monchegorsk becomes city. In 1938 G. entered V build first queue Severonikel plant, in 1940 the plant reached the full technological cycle [49]. In 1989 G. was educated state concern Norilsk nickel", V the composition of which entered plant Severonikel V 1994 G. Norilsk Nickel was incorporated; in 1998, Kola Mining and Metallurgical Company OJSC was established, united factories Severonikel and Pechenganikel into a single mining and metallurgical production facility. Today, a subsidiary of PJSC Mining and Metallurgical Plant Norilsk nickel" JSC Kola mining and metallurgy "Company" is the leading enterprise in the city of Monchegorsk. The city-forming enterprise accounts for 89.4% of the total output. Three rural settlements are located within the jurisdiction of the Monchegorsk municipal district. The population of Monchegorsk is 44,100 people, 56% of whom are of working age economy cities the main one share represent organizations — manufacturers of processing production and implementing activity enterprises by production, transportation and distribution electricity, heat and water. The recreational resources of the Monchegorsk district are popular with tourists for outdoor activities. Particularly popular are the Loparstan ski resort and the Lapland State Nature Biosphere Reserve, located in the city's outskirts. In 1985, it became a UNESCO World Network of Biosphere Reserves. Industrial interest V 1929–1932 gg. represented located V ore-bearing strip Zaimandrovsky district Monche tundra deposits, in connection with which a decision was made at the state level to develop the largest promising Olenegorsk iron ore deposit. In 1948 G. V composition trust Kolstroy was the construction department " Rudstroy " was established; V 1949 G. was organized Yono-Zaimandrovskoe the Kolzhelruda mine administration and the beginning of capital mining works at the Olenegorsk iron ore mine deposit. In this same year was founded Olenegorsky mine and populated paragraph Deer, which V 1957 G. was renamed V G. Olenegorsk; in 1960 G. Olenegorsk mine administration was renamed V Olenegorsky mining and processing plant; V 1993 G. plant transformed V JSC "Olcon"; in 2000 G. enterprise entered V compound PJSC Severstal.

In compound municipal districts G. Olenegorsk today are included the city of Olenegorsk and four settlements; the district is home to 29.6 thousand people, including the working-age population - 59.4%. The largest enterprises and main taxpayers in the city Budget [5]: military units, Olkon OJSC, and Olenegorsk Mechanical Plant OJSC. The district's territory is favorable for tourists: near the

town of Olenegorsk is the Simbozersky nature Reserve (the purpose of which is to protect rare animals). Kola peninsula), V 10 km from cities on shore Hare's lakes the agrovillage "Oleniy Bereg" is located here. Active development of the Kovdorsky District's muscovite mica reserves began in 1932. In 1933, an iron ore deposit was discovered here, and industrial mining began in 1934. Construction of a mining and processing plant and a workers' settlement began in 1953. In 1956, the village was transformed into an urban-type settlement. In 1962, construction of the Kovdor Mining and Processing Plant was completed, and in 1963, the second phase of the plant was launched. In 1965 G. Kovdor received status cities. In 1975 G. was Apatite was put into operation baddeleyite plant. The largest producer of apatite, iron ore and baddeleyite concentrates, JSC Kovdor Mining and Processing Plant plant" since 2001 g. is structural division of EuroChem MCC JSC. Today, the company's annual production of baddeleyite concentrate accounts for 100% of the world's total, and its share in apatite production concentrate — 18%. Share city-forming enterprises [57] V in general volume shipped goods own production makes up 94%, 38.8% of the working population are employees of JSC.

Territory Kovdorsky municipal districts make up G. Kovdor, as well as the settlements of Yonsky, Rikolatva, Kuropta, Leipi and the village of Yona. Modern Kovdor is one of the young industrial centers of the Murmansk region with a population of 17.3 thousand people, including 56.1% of working age city there is developed infrastructure, including sports a complex with a swimming pool, a ski slope, and a lighted ski slope and a sanatorium-preventorium.

Role largest supplier hydrocarbon raw materials on the Yamalo-Nenets Autonomous Okrug has secured its position in both domestic and global markets thanks to its unique hydrocarbon deposits. Gubkinsky, Muravlenko, Novy Urengoy, and Noyabrsk are typical Arctic industrial cities whose economies are tied to production activities in an oil and gas region with dispersed hydrocarbon deposits.

The formation of the city of Gubkinsky is associated with the industrial development of a group of promising by reserves hydrocarbon raw materials oil and gas deposits in Western Siberia. In 1967 G. was open Tarasovskoye a field within which 16 oil, gas condensate, and gas condensate fields were discovered and gas deposits. In connections with remoteness the future city was initially planned to be connected to the newly formed settlement of Purpe on the railway line, but the project was rejected for technological reasons. Then, the decision was made to build a city. V 17 km from stations Purpe. In 1986 G. on deposit was mined first ton industrial oil. Gradually was being settled deposit, and developed production power, were erected children's garden, school, a community center, a hospital, and a store. In 1988, the village was named after the founder of Soviet oil geology, Gubkinsky. In 1996, the village received the status of a city of district significance, and in 2021, the settlement of Purpe was incorporated into the city. In the 1990s, official development of the Gubkinsky oil and gas condensate field, discovered in 1965, began. deposits. In 1993 G. began exploitation Gazprom Dobycha Noyabrsk LLC of the Komsomolsk gas field, and in 1999, Purgaz CJSC developed the Gubkinskoye gas field.

Today the city's population is 38.3 thousand people, including 66 % — V able-bodied age. Economy cities provided for check activities enterprises fuel and energy complex (on complex have to near 42 % of average numbers workers). The largest projects are implementing an LLC RN-Purneftegaz, OOO SevKomNeftegaz, OOO "Yangpur", LLC "Kharampurneftegaz", OOO Belorusneft-Siberia, OOO Purneftepererabotka, Purpeisky Linear Production Department of Main Gas Pipelines OOO Gazprom transgaz Surgut". Near with city indigenous people live peoples — Nenets, Khanty, Selkups, Mansi — and lead my activities of the clan community " Dyanki -Koy" and the family clan community " Apydyu " ours."

The emergence of the city of Muravlenko is associated with the industrial development of Muravlenkovskaya groups oil deposits V Western Siberia. From drilled V 1975 G. search wells on Sutorminsky the first oil was extracted at the field. The first client for the construction of the town of Muravlenko was the oil and gas production department "Kholmogorneft ": in 1982, the first two-apartment houses (Talitsky wooden houses) were erected. The future town was named in honor of the Soviet organizer of the oil and gas industry, V. I. Muravlenko. In village came specialists from many regions USSR: to 1984 G. V him already lived 1.6 thousand person in 1990 G. settlement Muravlenkovsky came out of composition Purovsky district and became city district subordination Muravlenko. City-forming enterprise cities — branch Muravlenkovskneft JSC Gazpromneft-Noyabrskneftegaz, leading development 13 oil fields that have different stages of production and are located at a distance of 20 up to 150 km from the city. The modern city of Muravlenko is compactly structured (the layout is divided into residential and industrial zone). Number population is 31.3 thousand people, of which 48.6% are of working age (since 2012, it has been registered here decrease numbers population V connections with depletion of reserves old deposits oil and restructuring branch Muravlenkovskneft JSC Gazpromneft-NNG). Novy Urengoy is the industrial center of the Yamalo-Nenets Autonomous Okrug, founded in 1975 in connection with the development of the world's largest Urengoy field. In 1966, an exploratory well was drilled on the

field's territory, proving the existence of the promising Urengoy field. oil and gas condensate deposits, near with which The construction of a workers' settlement began. In 1975, state registration was completed. settlement New Urengoy, V 1978 G. — handed over first installation comprehensive training gas, began industrial exploitation Urengoy deposits, in result which was mined first billion cubic meters Urengoy gas. In 1980 G. New Urengoy was assigned status cities district values. In 2004, the Pestsovoye deposit was put into commercial operation.

Number of people population New Urengoy Today makes up 118.7 thousand people, of which 65.7% are of working age. The modern economy of Novy Urengoy determine related with prey gas, condensate and oil enterprises included V compound PJSC Gazprom, the share of the fuel sector of the city's economy in total tax revenues is more than 60%. Exploration drilling V Noyabrsky area was started V 1968 G. V connection with opening Vyngapurovsky and Vyngayakhinsky deposits. In 1975 G. The Karamovskoye and Sutorminskoye fields were discovered, and a fountain of anhydrous oil was obtained at the first production well. In 1976, the Novogodnoye field was discovered, and in the same year, the settlement of Noyabrsky was marked on maps, and construction began on the Noyabrskaya railway station, an airfield, and a station settlement. In 1978, the Vyngapurovsky gas field began operations. In 1979, in connection with receiving the status of a workers' settlement, Noyabrsky was renamed Noyabrsk. In 1982, the workers' settlement Noyabrsk Purovsky district was transformed V G. Noyabrsk district subordination. Today number population 109.5 thousand person, from them 67 % of the working-age population. Indigenous peoples of the North—the Nenets, Khanty, and Selkups—live near the Novogodny deposit. The city of Noyabrsk is the central link in the Noyabrsk-Muravlenko agglomeration. — Khanymey, here enough developed transport Infrastructure (road, rail, and air routes). Noyabrsk Airport is the main airport of the Yamalo-Nenets Autonomous Okrug, providing transport accessibility to the region. Historically development arctic territories Russia wears strategic (spot settlement and creation of development bases) and economic (use territories and natural resources) significance. The largest Arctic complexes have their own specific characteristics. Among the main features of the old industrial cities of the Russian Arctic is the cyclical nature of production activities, which determines the prospects for the socio-economic development of such cities. The Arctic subcenters of the Yamalo-Nenets Autonomous Okrug are practically devoid of innovative development potential. Industrial cities Russian Arctic are playing the main one role in the modern vector of the Arctic policy of the Russian Federation, since the implementation of the largest economic projects suggests formation demand for high-tech And knowledge-intensive products And stimulates production of such products. Among main directions implementation such vector in the Murmansk region - geological study of the mineral resource base, the formation of mineral resource centers specializing in extraction And enrichment useful fossils, development tourist and recreational clusters. In the Komi Republic - economic diversification and comprehensive socio-economic development of the city of Vorkuta, development of coal mineral resource centers on Pechora coal mine base basin, geological study individual territories And development mineral resources bases solid useful mineral resources, reconstruction and modernization of the airport network, including the joint airport in Vorkuta. In the Krasnoyarsk Territory, this includes the comprehensive socio-economic development of Norilsk, the development of the Norilsk Industrial district, construction new mining capacities Zapolyarnaya mines , Creation V Norilsk research center construction technologies and monitoring states buildings and structures on northern and arctic territories, development tourism and recreation cluster in the city. In the Yamalo-Nenets Autonomous Okrug, the main areas of implementation of the Arctic vector of the Russian Federation's state policy include: the development of oil and gas chemical industries in the area of the villages of Sabetta, Yamburg, and Novy Urengoy and the formation of a multidisciplinary industrial and technological complex gas processing and petrochemicals; development technologies for involving low-pressure natural gas into industrial circulation, etc.

Undoubtedly, the implementation of the Arctic vector of Russia's state policy must take place in parallel with the maintenance and modernization of existing infrastructure and the creation of conditions for a comfortable life for the population. for beyond production zones. In this aspect especially there is a pressing need to identify structural changes in industrial production such cities, consideration problems and opportunities diversification of urban economies and development of entrepreneurial activity. Sustainability of the socio-economic development of industrial cities Russian Arctic is determined natural and climatic conditions, cyclicality production activities, addiction production from external market conditions prices on raw materials and main articles export, global crisis phenomena. World financial crisis 2008 G. produced decrease demand and prices for coal products: decrease prices implementable JSC Vorkutaugol And JSC "Shakhta" Vorgashorskaya 2» (included V compound JSC Vorkutaugol V 2012 d.) coal on 29.5 % led to reduction revenue enterprises on 3385 million rubles (the reduction in sales volumes of coal products amounted to 9%), the volume of tax receipts V budgetary system decreased on 1.5 billion rub. In as a result of mass releases number

registered V quality the number of unemployed citizens increased in 2008–2009 on 29 % (average the number of employees at JSC Vorkutaugol decreased by 19% in 2009. In the cities of Novy Urengoy and Noyabrsk, the level of industrial production decreased on 40 %, volumes own municipal revenues budgets decreased by 16–18 %. Revenue of PJSC MMC Norilsk Nickel decreased by 49% in 2008–2009. led to fall volumes capital investments V 2 times. The final as a result reductions prices on metals became reduction tax revenues, reduction in the budget revenues of industrial cities. Significant deficit local budgets V 2008–2009 gg. formed in the cities of Norilsk, Novy Urengoy, Monchegorsk, and the Kovdorsky district (Table 1). low share tax and non-tax income local budgets in in general volume own income (table 2) took shape V cities Muravlenko, Gubkinsky, Noyabrsk, a significant increase in the values of this indicator in 2009–2024 occurred in the cities of Kirovsk and Monchegorsk.

Table 1. Surplus/deficit budgets industrial cities of the Russian Arctic, million rubles

City	2007	2008	2009	2013	2014	2015	2019	2020
Vorkuta	94.1	236.1	216.2	104.5	-343.4	-132.1	-104.3	-50.9
Norilsk	1552.6	-977.6	-2011.0	-798.7	1241.3	561.7	1377.2	1113.2
Kirovsk	61.2	-40.6	27.5	-75.3	-47.2	-12.9	-104.4	-93.6
Monchegorsk	389.9	-279.3	-277.8	-88.8	-186.9	-246.9	-2.8	-14.3
Olenegorsk	-8.4	-60.6	-74.9	-8.9	-137.7	-151.1	-4.9	22.8
Kovdorsky district	-13.8	-7.0	-215.7	-66.5	-35.7	-0.2	5.8	5.7
Gubkinsky	52.9	-69.1	44.3	55.6	-105.3	-49.4	1.2	299.3
Muravlenko	3.6	28.2	25.6	-105.8	-28.4	93.4	7.0	199.2
New Urengoy	928.2	-278.5	-593.7	-799.3	-648.7	-171.4	681.8	1026.5
Noyabrsk	103.2	131.4	286.2	-250.1	-90.7	23.0	68.2	86.5

Table 2. Share tax And non-tax income local budget in in general volume own income budgets industrial cities of the Russian Arctic, million rubles

City	2009	2013	2014	2015	2019	2020
Vorkuta	37.0	48.0	57.0	53.0	42.1	37.8
Norilsk	79.0	75.0	72.0	55.0	68.0	85.7
Kirovsk	43.9	86.0	92.2	88.7	69.0	74.0
Monchegorsk	38.7	60.3	86.7	85.4	67.3	62.0
Olenegorsk	48.0	65.4	54.4	84.6	48.0	39.9
Kovdorsky district	39.8	60.9	68.8	71.8	63.9	38.0
Gubkinsky	n.d.	33.4	35.3	31.7	20.5	17.8
Muravlenko	n.d.	20.8	21.9	24.0	13.6	11.9
New Urengoy	n.d.	73.9	71.0	75.0	47.4	47.0
Noyabrsk	n.d.	36.3	49.6	42.8	28.0	24.0

Today, in the industrial cities of the Yamalo-Nenets Autonomous Okrug, decrease volumes receipts taxes on income physical persons from city-forming enterprises. In the city of Muravlenko, this trend is due to restructuring JSC Gazpromneft-NNG (V 2024 G. deductions Personal income tax on enterprise V local budget for comparison with 2023 G. decreased on 14 %). Global financial crises have a negative impact on investment activity. city-forming enterprises, dependent from prices on raw materials, depending on the state of hydrocarbon markets. For example, by the volume of investments V basic capital for check funds local budgets (table 3) V In the pre-crisis year of 2007, the cities of Norilsk, Novy Urengoy and Noyabrsk were in the lead; in 2007–2009 volume investments V basic capital V G. New Urengoy decreased V 33 times, in G. Norilsk - V 6.8 times, V G. Noyabrsk — V 3 times.

An unfavorable price environment in global markets has developed in 2024 for Russian exporters: decrease average annual world prices on nickel relatively 2023 G. amounted to 29.8 %, on copper — 19.8 %; the growth rate of the average annual dollar exchange rate in 2023–2024 was 158.9%. However, less weakening course rubles produced height revenue ZF PJSC "MMC" Norilsk Nickel" (V rubles) and allowed improve financial and economic indicators of the company (in 2024, the

growth in the volume of metallurgical production and production of finished products amounted to 16.2%).

Table 3. Investments V basic capital for check funds municipal budgets of industrial cities of the Russian Arctic, million rubles

City	2007 G.	2008 G.	2009 G.	2013 G.	2015 d.	2018 d.	2020 g.	2022 d.	2024 d.
Vorkuta	8.6	40.7	68.1	122.3	251.3	43.4	26.8	18.7	10.6
Norilsk	1517.5	702.7	221.8	138.7	384.2	1015.7	643.2	957.4	1082.3
Kirovsk	30.1	70.0	66.7	57.8	55.8	47.3	67.6	99.5	138.4
Monchegorsk	76.5	123.1	254.3	52.6	35.1	106.9	24.0	56.4	77.1
Olenegorsk	59.3	64.8	84.0	68.6	13.5	13.9	44.4	23.8	45.0
Kovdorsky district	26.6	44.4	15.3	66.6	94.0	4195.1	5.4	7.9	10.0
Gubkinsky	221.8	41.5	128.6	116.6	113.7	62.5	792.0	1492.4	1145.4
Muravlenko	215.8	717.8	n.d.	748.9	584.7	18.4	41.6	99.5	507.0
New Urengoy	745.4	583.8	22.5	333.6	267.4	150.8	230.4	406.8	440.3
Noyabrsk	709.2	398.5	239.5	605.4	119.4	804.3	363.3	550.7	677.4

In general, the dynamics of investment in fixed capital in industrial cities Russian Arctic wavy, because significant the share in the structure of this indicator is formed by vertically integrated companies: leading positions by volume investments V basic capital the cities of Norilsk, Novy Urengoy, Noyabrsk, Kirovsk, and the Kovdorsky district occupy the Russian Arctic (Table 4). This situation is due to the varying degrees of intensity of the implementation of large investment projects by enterprises in industrial cities of the Russian Arctic. The main Part investments G. Norilsk — investments V development and modernization of industrial production and environmental safety. In G. New Urengoy V investments V basic capital share fuel and energy complex makes up 79 %. In the city of Kirovsk, the size and dynamics of investments in fixed capital are determined by the Kirov branch of JSC Apatit and JSC SZFK: in 2024, the total volume of investments city-forming enterprises compiled 79.4 % from general the amount of investment in fixed assets. In the Kovdorsky District, 98% of investments are made up of the equity capital of EuroChem OJSC and Kovdorsky Mining and Processing Plant JSC. In the city of Olenegorsk, 90% of investments are made up of Alkon JSC.

Table 4. Investments in fixed capital carried out by organizations located on territories industrial cities Russian Arctic (excluding small businesses), million rubles.

City	2009	2013	2014	2015	2020	2023	2024
Vorkuta	2641.8	42749.5	22275.8	21703.6	7105.9	9060.8	8527.9
Norilsk	16911.5	43053.9	44757.5	74394.3	57877.3	89079.2	153200.8
Kirovsk	4868.8	17343.6	12674.6	13906.9	17682.6	20605.4	20498.0
Monchegorsk	1092.5	1699.2	2929.9	6804.5	9511.3	8124.3	11250.4
Olenegorsk	520.7	1911.2	2117.4	1357.1	3562.2	2062.9	3802.9
Kovdorsky district	854.7	4897.7	4200.1	4195.1	9363.0	14426.9	11718.0
Gubkinsky	1991.5	2232.0	3297.4	2579.4	5097.2	5752.1	4840.7
Muravlenko	1067.4	4017.9	1438.0	2563.4	1656.0	1276.7	2498.2
New Urengoy	17477.3	61313.5	62780.4	100047.3	42292.8	37589.4	54255.8
Noyabrsk	8838.4	11000.6	6280.1	7944.7	21416.6	30608.0	12958.2

Global crisis phenomena and dependence of production activities city-forming enterprises from external market conditions prices on raw materials and main export items have a negative impact (Table 5) on the situation in the labor markets of industrial cities in the Russian Arctic.

In in particular, V 2015–2016 gg. level registered unemployment V G. Gubkinsky increased on 71 %, G. Olenegorsk — on 53 %, G. Monchegorsk — by 46%. In 2023–2024, the registered unemployment rate in Noyabrsk increased by 120%, in Kirovsk — by 42%. To prevent a critical unemployment situation during periods of crisis, regional executive authorities implemented additional measures aimed at decrease social tension on territorial markets labor. In among them were leading professional education located under threat of dismissal workers city-forming enterprises, organization

public works and temporary employment, development entrepreneurial initiatives. Timely implementation such measures allowed hold back height registered unemployment and ultimately bring this indicator back to pre-crisis levels.

Table 5. Level registered unemployment V industrial cities of the Russian Arctic, %

City	2007	2008	2009	2013	2014	2015	2020	2023	2024
Vorkuta	2.9	2.6	3.4	1.0	1.0	1.3	1.5	1.8	1.2
Norilsk	2.4	1.4	1.8	0.9	0.9	0.8	0.6	1.7	1.4
Kirovsk	5.1	3.7	4.8	2.4	3.1	4.4	2.4	2.6	1.7
Monchegorsk	5.4	3.5	5.1	2.1	2.2	2.7	2.2	2.5	1.7
Olenegorsk	2.7	2.8	4.3	1.4	1.6	1.9	1.7	2.3	1.9
Kovdorsky district	5.3	4.1	5.7	3.5	3.3	3.9	2.3	2.8	1.8
Gubkinsky	1.2	0.7	1.2	0.5	0.4	0.6	0.4	1.0	0.4
Muravlenko	n.d.	3.7	2.6	0.9	0.9	1.1	0.7	1.9	0.9
New Urengoy	1.9	n.d.	1.9	0.4	0.4	0.6	0.3	1.9	0.3
Noyabrsk	1.8	2.4	1.9	0.3	0.5	1.1	0.7	3.3	1.3

The unemployment situation in industrial cities of the Russian Arctic has been negatively impacted by the spread of the COVID-19 coronavirus infection: in connection with the introduction of restrictive measures aimed at to ensure the sanitary and epidemiological well-being of the population, and rules of conduct, mandatory for execution by the population and enterprises in connection with threat distribution infections, dynamics unemployment worsened. In all the cities under consideration, there was a significant increase in the level of registered unemployment (peaks growth came in handy on May, June 2024 g.). Nevertheless, under these conditions, the situation in the labor markets of industrial cities in the Russian Arctic in 2023 remained manageable due to the implementation of measures to create temporary jobs. In 2024, industrial cities in the Russian Arctic returned to pre-pandemic levels in terms of registered unemployment. Modern state majority objects industrial infrastructure cities Russian Arctic not allows create conditions for sustainable territorial socio-economic development, V including for comfortable life activity. The most important factor ensuring stability work enterprises and, hence, sustainable socio-economic development industrial cities Russian Arctic - infrastructure security, including transport availability and housing and communal services economy. So, typical for Russian Arctic shortage transport paths messages narrows choice profitable ways transportation cargo: limitations and low quality objects transport infrastructure actually stop the extensions production volumes because of colossal transportation costs. Length of automobile roads arctic regions of Russia is 0.6 % in total length highway networks Arctic zones Russian Federation (solid the coating has only 79.5 %), more half automobile roads general the use does not meet the technical and operational standards. By data Federal services state statistics, share length automobile roads general use local values that do not meet the relevant standards, in cities such as: Kirovsk, makes up 43 % V general length such roads, V G. Olenegorsk - 54.3%, Monchegorsk - 78.6%, Vorkuta - 63.1 %, Norilsk - 30.1%, Novy Urengoy — 0.6 %, Muravlenko — 11 %, Gubkinsky — 22.6 %, Noyabrsk — 44.4 %. The most acute problem industrial cities Russian Arctic — provision of modern housing and communal infrastructure facilities. About lack of comfort urban spaces testify availability dilapidated and emergency housing, low level of social and engineering infrastructure, high wear municipal systems water supply and high the share of inefficient heat supply with low loads and remote fuel delivery. So, V connections with closing mines on territories G. Vorkuta share of empty housing compiled 40 % from general quantities municipal residential fund; at this annual expenses by payment for heating and content of empty housing fund make up 580 million rub. Wear engineering infrastructure (Usinsky water pipeline Vorkuta) makes up 95 %. In G. Physical deterioration in Norilsk housing accounts for 50%, under special control (according to the condition of load-bearing designs and soil) located 33 % residential houses. In G. Gubkinsky 43 % housing fund located V emergency condition.

The current state poses a threat to epidemiological security V conditions eternal permafrost systems — heat supplying, water supply and sewerage. In the city of Gubkinsky only 10% street and road networks provided downpour sewerage; more 30 % of the total length of main collectors in Norilsk are in dilapidated or emergency condition. In 2014–2024, the length of heating networks, those in need V replacement, V G. Kirovsk increased V 8.2 times (Table 6), in the city of Gubkinsky - 6, in the city of Novy Urengoy - 3, in the city of Olenegorsk - 1.7 times. Length needy V

replacement street plumbing networks V G. In Vorkuta it increased by 4 times, in Norilsk – by 2.3 times; the length of the area in need replacement street sewer networks V G. Norilsk grew up V 6.4 times, in Novy Urengoy - 4.7 times.

Table 6. Main indicators infrastructure provision of industrial cities Russian Arctic, 2018 and 2024 gg.

Single-industry town	Thermal And steam networks in two-pipe calculation, requiring replacement, km		Street water supply network in need replacement, km		Single extension street sewer network in need of replacement, km	
	2018	2024 g.	2018 g.	2024 g.	2018 g.	2024 g.
Vorkuta	142.5	32.8	6.0	23.7	20.0	14.8
Norilsk	40.2	53.9	11.2	4.1	6.5	42.1
Kirovsk	2.0	47.7	0.3	0.0	0.1	0.0
Monchegorsk	54.0	44.5	9.4	20.9	0.2	6.8
Olenegorsk	9.7	15.0	5.4	3.7	n.d.	0.8
Kovdorsky district	20.9	21.7	4.8	0.8	0.9	1.5
Gubkinsky	2.3	24.4	0.5	4.2	0.5	0.6
Muravlenko	58.4	22.9	27.5	3.0	10.5	7.0
New Urengoy	29.0	94.9	2.6	1.1	1.0	0.7
Noyabrsk	148.0	178.4	36.3	7.8	n. d.	12.5

In G. Monchegorsk wear to 100 % have 72 % water supply networks (there is a high rate of wear and tear of water supply inlets to residential buildings and educational facilities and health care); is relevant problem uninterruptible providing consumers with thermal energy (the heat supply system is characterized by high degree wear and tear main funds, large losses energy and water). Scheme power supply cities initially was built without taking into account future development and has a low degree of reliability (capacity of transformer substations and network throughput built between 1938 and 1965 (These are designed only for housing stock not equipped with electric stoves.) Another problem in the socio-economic development of industrial cities in the Russian Arctic is related to the environmental threat to public health and the need to eliminate accumulated environmental damage. and environmental restrictions in the development of industrial activities. Significant influence on ecosystems mechanical violations vegetation, soils, permafrost soils, emissions V atmosphere toxic the mining industry produces compounds. Surface waters are polluted: the main reservoirs of pollutants are small lakes (in areas near mines, water bodies are characterized by high values of total mineralization, content organic substances). So, analysis The peculiarities of accumulation of heavy metals in fish of small lakes in the Murmansk region show the negative consequences of aerotechnogenic pollution of water bodies of JSC Kola MMC (natural fish populations are susceptible to the toxic effects of heavy metals), associated with the danger of reducing biological diversity ichthyophase. Significant seasonal fluctuations contents nickel V water caused by the fact that, concentrating V snowy cover V flow long-term winter period, polymetallic dust gets into the atmosphere in increased quantities with the onset of snowmelt V reservoirs G. Monchegorsk. In result dust and gas emissions and discharges with wastewater waters plant Severonikel polluting substances enter the lakes Monche (object of category I for domestic and drinking water use) and Imandra (object of category II for cultural and domestic water use).

A problematic issue in the field of environmental protection — appeal waste management: virtually all types of industrial activity in tundra conditions and forest-tundra produce education not capable to self-restoration of vast areas. Before 25% formative health human factors have to on environmental issues, while their contribution to the formation of public health problems becomes more weighty, When speech is coming O the population of single-industry towns in the Russian Arctic living in extreme natural conditions. Murmansk region — one from main hotbeds of environmental tension in the Russian Arctic: a critical environmental situation not only in single-industry towns, but also in adjacent territories (agglomerations) produces high rates of 95 classes of environmentally dependent diseases (diseases organs breathing, skin and subcutaneous fiber, congenital anomalies, malignant neoplasms, diseases of the blood and hematopoietic organs). Among polluting atmosphere substances — oxide nitrogen, formaldehyde, phenol, lead, nickel, dioxide sulfur, benzene, benzopyrene, fluorides, inorganic dust, etc. The largest volume of polluting emissions into the

atmosphere occurs in the Pechenga region (JSC Kola MMC). Industrial specialization Apatity -Kirov agglomeration (KF JSC Apatit) produces the prevalence of diseases of the circulatory system (here level morbidity By such class reasons V 1.6 times higher, than in the central zone), diseases of the musculoskeletal and genitourinary systems (2.6 times), diseases of the eyes and adnexa (2.7 times). In the city of Monchegorsk (JSC Kola MMC), the mortality rate of the male population from diseases of the circulatory system is 35% higher than the average by region And V 1.5 times above the Russian average level.

In conclusion, we note the current context of the dynamics and prospects for the development of the Russian Arctic in the context of achieving strategic development goals Arctic zones Russian Federation means scale tasks, the solution of which consists of, Firstly, V updating risks and opportunities greening and social responsibility of vertically integrated companies, production branches which lead my activity V in the Arctic, secondly, V supporting roles states how regulator conditions for the development of business initiatives. In this regard, promising development opportunities industrial cities Russian Arctic determine involvement of vertically integrated companies in socio-economic development planning cities presence their own production divisions and increasing the effectiveness of government instruments to support the development of such cities.

How it was noted us V previously V this chapter, For Murmansk In the Murmansk region, which has seven single-industry municipalities within its territory, the development of single-industry towns is a pressing issue. As Arctic territories, single-industry towns in the Murmansk region, in addition to the risks inherent in all single-industry municipalities in the country, are characterized by complex situation V sphere life activities, related to climatic conditions, infrastructure and transport and logistics specifics, what causes special interest for analysis socio-economic environment their development, in in many ways dependent from functioning city-forming enterprises.

Single-industry towns in the Murmansk region have a certain influence on the overall situation that is developing V region. In them lives 133 228 people (on 1 January 2024 G.), or 20 % of the region's total population. City-forming enterprises single-industry towns provide over 75% of industrial production, and about 15% of the consolidated revenue regional budget also is being formed in single-industry towns. Single-industry towns of the Murmansk region attributed to first and second categories of the list of single-industry municipalities. In first list category with most complex socio-economic position are included Kirovsk, Kovdor And Revda, ko second attributed cities Monchegorsk, Nickel, Zapolyarny, Olenegorsk, where there are risks of deterioration of the socio-economic situation.

To identify problems and opportunities for the development of municipalities, we will conduct an analysis of their provision with investment and budgetary funds and human resources.

Single-industry towns Murmansk region — this by advantage small cities with number to 40 thousand person Demographic situation in them fundamentally not changes, that there is remains complex and in some places critical, for example, V Revda has a population of less than 10 thousand people.

During the study period (from 2014 to 2024), the permanent population decreased in all municipalities (Figure 1). The maximum decrease numbers V latest two years recorded in Revda (with 8002 person V 2022 G. to 7831 person V 2024 G.) and Nikel (with 11 412 person V 2022 year before 9858 people in 2024 G.).

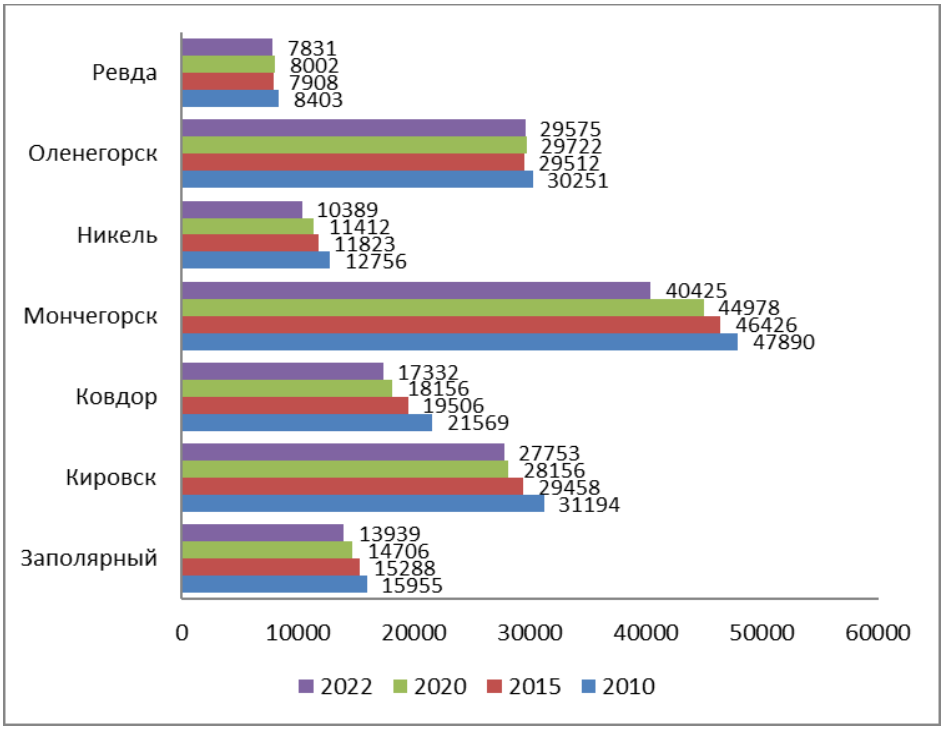

Figure 1. Dynamics numbers population single-industry towns Murmansk region
Source: Single-profile education Russian Federation (monotowns).

Reasons abbreviations population are natural Population decline and outflow (Table 7). Natural population decline in single-industry towns averages approximately 130 people annually, while migration rates range from -325 to +181 people.

It can be assumed that an additional circumstance causing decrease numbers population, is resettlement permanent residents upon reaching retirement age in regions with more favorable conditions conditions accommodation. In 2023 G. essential the introduction of restrictive measures aimed at preventing the spread of the new coronavirus infection, for example, had an impact on migration flows. V Kirovsk was recorded uncharacteristic for him migration population growth.

It should be noted that Kirovsk, although by the end of 2024 it was included in the top ten of the TOP-10 best single-industry towns that demonstrated a high level of socio-economic development, is also characterized by a long-term trend reductions residents. With 2014 G. his number population decreased by 14%. This example shows that the socio-economic development of a city does not always have a significant impact on population dynamics.

Table 7. Indicators migrations and natural growth (loss) in single-industry towns of the Murmansk region.

Single-industry town	Level migrations, person.				Natural increase (decrease) in population, people			
	2015	2020	2023	2024	2015	2020	2023	2024
Zapolyarny	-142	-108	-328	n. d.	8	31	-43	n. d.
Kirovsk	-183	-183	181	-45	-82	–100	–238	–288
Cowdor	–321	–271	–285	–179	–54	–73	–149	–206
Monchegorsk	116	–67	–273	139	–98	–154	–293	–447
Nickel	n. e.	–178	–203	n. e.	n. e.	–38	–55	n. e.
Olenegorsk	-266	185	-60	214	7	12	-104	-186
Revda	-15	-75	-40	-3	10	-11	-37	-91

Despite the government measures taken (for example, in Kirovsk, the Strategy for the Development of the City until 2035 was adopted, which is an integral part of the Development Strategy of the Murmansk Region and the "Living in the North" plan), aimed at "retaining" the population in the North, the migration balance remains negative, which is a negative factor for socio-economic development and, above all, the formation of labor potential in single-industry towns. More Togo, pace

reductions numbers population younger of working age and able-bodied age V studied cities exceeds The average figure for the Murmansk region. Migration flows mostly involve people of working age, which affects the age and gender structure of the population of single-industry towns. How it was noted us higher, single-industry towns Murmansk region very heterogeneous with points vision their investment opportunities. Volumes investments in single-industry towns of the Murmansk region region in 2024 fluctuated from 47 million rubles in Revda Up to 20 billion rubles in Kirovsk. The largest per capita investment volume is in Monchegorsk and Nikel, and Olenegorsk. Maximum volume investments on soul population V 2024 G., how and V more early years, was achieved V Monchegorsk — 263 thousand rubles, the lowest level of investment per capita, which is several times lower than in the rest single-industry towns, observed V Kovdor on level 2 thousand rub. At In this regard, one of the highest and sharpest rates of investment growth (83%) in 2024 was registered in Olenegorsk, where JSC Olkon invested more than in 2024 3 billion rub. By directions support natural raw materials bases and updates parka equipment mining and transport and factory complex.

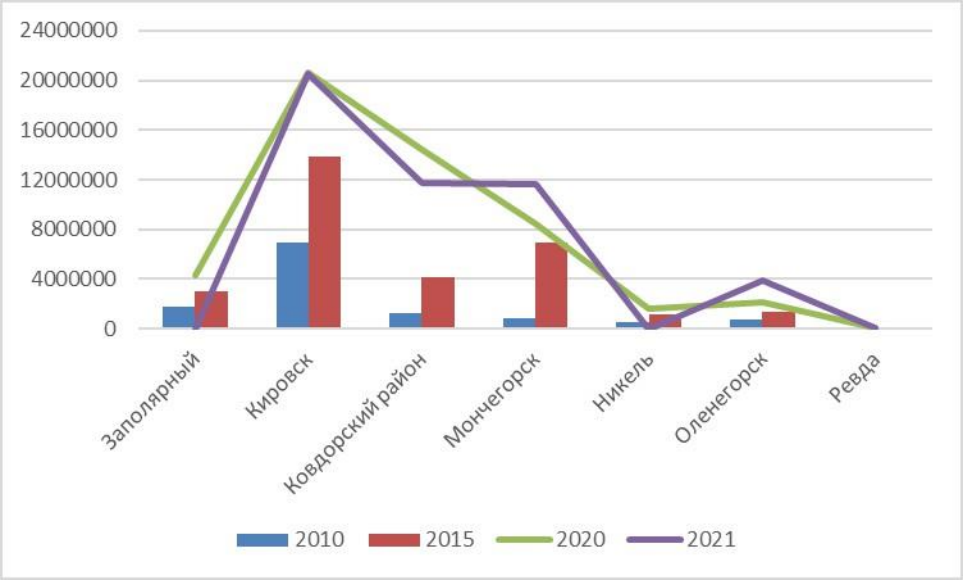

Figure 2. Level investments V single-industry towns in total, thousand rub.

An analysis of investment resources from the perspective of sources of income showed a sharp change in the situation in 2024, when the pandemic began and various anti-epidemic measures and government support measures were adopted.

If by 2024 the level of investment in fixed capital in all municipalities for check funds municipal budget had descending trend with fluctuations V separate years, that starting with 2024 G. observed significant increase, although share this source V in general volume investments remain insignificant — less 1 %. The largest specific weight occupy investment resources, received from located on territories single-industry towns of organizations. Their level V single-industry towns Murmansk region reaches over 90 %.

One of the key indicators reflecting the well-being of residents of a particular territories, is the level of budgetary provision on per capita. In terms of budgetary security, three single-industry towns in the Murmansk region (Kirovsk, Monchegorsk, Revda) are subsidized practically every year researched period (exception Revda V 2019 G., when surplus budget amounted to 991 thousand rub.) and four (Zapolyarny, Kovdor, Nickel, Olenegorsk) will have a budget surplus from 2024 and, accordingly, the potential to invest additional funds in development. All single-industry towns are clearly showing a trend toward a declining share of tax revenues and increasing dependence on federal financial assistance. Decrease tax budget income this is primarily due to a reduction in the most profitable tax for single-industry towns—the personal income tax. The share of gratuitous receipts in municipal budgets is steadily increasing practically V each single-industry town and varies from 46 to 65%. The highest height gratuitous receipts celebrated V Olenegorsk - in 2024 by 300 million rubles. The noticeable increase in gratuitous receipts during the coronavirus crisis year was due to the adoption of a number of measures that allowed them to quickly react on established situation and accept economic support measures. In summary, we can note that single-industry towns in the Murmansk Region are territories with signs of social and economic contradictions, which can have a significant destructive impact on their development and require a special, differentiated approach to management. The analyzed statistical indicators

highlight the existing development challenges facing single-industry towns in the Murmansk Region, the most pressing of which is the limited economic base of municipalities. And decrease human potential, complicating comprehensive balanced development of cities.

The current socioeconomic development of single-industry towns in the North continues to exhibit the negative trends that emerged in the early 2000s: population outflow; declining living standards and quality of life; rising unemployment; low economic diversification and worsening social problems; and deteriorating environmental conditions. However, the expanded scope for government influence on single-industry town development, the operation of specialized funds and development programs, is being utilized far from evenly, exacerbating the disparities between relatively prosperous and disadvantaged areas.

In such conditions, it becomes important to conduct a "primary" comprehensive assessment of the development of a single-industry town, which allows identifying problem areas, determine the position cities among others cities and designate the main direction for development (Fig. 3.4), and then develop individual approaches with taking into account socio-economic and geographical features to management and development single-profile education. In framework proposed conceptual models assessments development single-industry towns supposed determine development options based on four main parameters - socio- economic status, population size, geographic location (remoteness), transport accessibility (road, rail, air, water, etc.). The three alternative development options presented are based on the assumptions of varying degrees of functioning of the city-forming enterprises. Correct choice Togo or other this option will help determine future prospects and reduce the risks of reaching the point of no return, when a decision is required to support the development of a single-industry education or its liquidation.

Figure 3. Conceptual model assessments development single-industry towns.

Conclusion

In quality general goals development single-industry towns Murmansk region on perspective Can name diversification economic a base, the achievement of which will require the implementation of investment programs for the introduction of new technologies, the development of small and medium-sized innovative businesses, the

relief of social tensions, and the creation of a unified recreational network.

For preservation stable socio-economic situations In single-industry towns, it is necessary to continue the process of signing agreements between regional authorities and city-forming enterprises, that is, it is necessary to achieve a balance in the triad "population - city-forming enterprise - government", which implies ensuring the principles of fair social provision, economic efficiency and environmental safety in the territory of all single-industry towns in the Murmansk region without exception.

For solutions demographic problems necessary strengthen work on attraction young specialists, continue development everyone levels of education taking into account professional orientation students on the activities of the city-forming enterprises, raise comfort accommodation V cities. Important task everyone single-industry towns Murmansk region is development of social infrastructure and formation comfortable urban environment (construction children's gardens, sports facilities, capital school renovation, modernization urban places rest and etc.).

It is also necessary to increase support for small and medium-sized businesses that provide additional workers places V single-industry towns, V volume including within the framework of the preferential regime of the AZ, and to expand the range of needs of residents met.

It can be assumed that during the current crisis the differentiation of socio-economic provisions single-industry towns will continue to intensify and will require new "recipes" regional politicians for complex development of territories in line with complex changing conditions, taking into account the activities of city-forming enterprises.

References:

1. Devyatkin, P. N. (2024). Natural water resources district G. Monchegorsk V operating conditions of JSC Kola Mining and Metallurgical Company. *Bulletin of Moscow State Technical University. Series: Natural Sciences*. 2024. No. 3, v. 11, pp. 393-397.
2. Didyk, V.V. (2025). Regional investment policy in the North of Russia/ *Spatial economy*. 2025 No. 4, pp. 90-101.
3. Emelyanova, E. E. (2025). Expenses municipalities and income population Russian Arctic / *ECO*. 2025 No. 7 (541), pp. 80-98.
4. Efimov, I. P. (2025). Personnel needs of the Russian Arctic economy: a look into future / / *Questions economics*. 2025, no. 8, pp. 118-132. DOI:10.32609/0042-8736-2025-8-118-132
5. Zamyatina, N. Yu. (2025). Russian Arctic: towards a new understanding of development processes / *Lenand*, 2025, 395 p.
6. Ivanova, M. V. (2025). *Formation of a mechanism for interaction between socially responsible business and regional authorities in the Arctic zone of the Russian Federation* / 2025. Vol. 13. No. 1,- pp. 56-69. DOI: 10.15838/esc.2025.1.67.3.
7. (2025). *Innovative basis for the strategy of integrated development of mineral resources* / Yekaterinburg: Ural Branch of the Russian Academy of Sciences, 2025. 360 p.
8. Kabanova, I.V. (2025). Socio-economic development Russian Federation (on example city of Novy Urengoy). *Bulletin of Moscow University named after S. Yu. Witte*. Series 1: Economics and Management. 2025. No. 4 (15) -- pp. 25-31.
9. Kazanin, O.I. (2024). Mountain education V XXI century: global Challenges and Prospects. *Notes of the Mining Institute*. 2024. Vol. 225, pp. 369-375. DOI:10.18454/PMI.2024.3.369
10. Kalinin, M. O. (2025). *Analysis applications innovative materials For solutions to problems of safe construction in the Arctic Arctic: modern approaches To production and ecological security V oil and gas sector of the city Tyumen*, 2025,- pp. 96-99.
11. Kalinnikov, V. T. (2025). *Complex processing of apatite-nepheline ores: state And Prospects* / Complex processing of apatite-nepheline ores. 2025, pp. 5-15.
12. Kaplunov, D. R. (2024). Conditions for sustainable development of the mineral resource complex of Russia / *Mining information and analytical bulletin* (scientific and technical journal). 2024. No. S1-1,- pp. 3-11.
13. Karpov, V. P. (2025). Soviet historical experience of Arctic development in the mirror of modern problems. *Herald Tomsk state University. History*. 2025. No. 63, pp. 25-30.
14. Klyukina, E. C. (2024). Ecological threats health population industrial areas Arctic region. *Works Kola scientific center RAS*. 2024. T. 9, No. 2-13 -- p. 91-103. DOI: 10.25702/KSC.2307-5252.2024.9.2.91-103.

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Issue Article

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METHODOLOGICAL ASPECTS OF SUCCESSFUL STABILIZATION OF PRODUCER ACTIVITIES IN CONDITIONS OF ECONOMIC INSTABILITY

Abstract: *In this article, the authors came to the realization that an integrated approach to managing the quality of materials and products has remained a mystery. The reason is simple: most authors merely planned such research but never implemented it due to its complexity. Currently, this problem is solvable because it is now manageable and a step toward philosophical closure is possible. Perhaps not everything will work out, but we decided to take the risk.*

Key words: *integrated approach, quality management, philosophical shore, materials, finished products, hedgehog in the fog, comprehensive research, worldview, methodology.*

Language: *English*

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Introduction

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A significant portion of traditional Russian industries developed in the Non-Black Earth Region, primarily around Moscow. The geography of the history of light industry is understandable. There was a stable market and no shortage of workers, and God has not deprived Russians of talent. After twenty years of returning to capitalism, industries that had been perfected over centuries have either been lost or are dying out, hopeless. No politicians are sounding the alarm that it's not the factories, workshops, or production lines that are dying, but the entire national

work culture that is crumbling. Kuznetsov porcelain, Ivanovo textiles, Kostroma lace, Palekh, Mstera, Kholuy, Fedoskino, Zhostkovo, Gus-Khrustalny, Dymkovo, Khokhloma—all of this made us Russian. What are politicians doing to save and stabilize the economic situation? Former assistant to Yu.M. Luzhkov, Resin, who has left his government post for a seat in the State Duma, announces to the entire country: a plan to build 200 (!) churches in the capital has been approved, ensuring that every church is within walking distance for Muscovites. The claim that the project won't require budget funds is a lie. Moscow's budget may not be used, but Russians will still have to foot the bill. Why not invest these funds in rescuing Russian national industry (there was such a concept as "local industry"), villages, and ancient towns—strongholds, incidentally, of Orthodox culture? Tourists won't visit standard church buildings, but the lack of world-famous local products will leave them deeply disappointed. Shoes can be made anywhere—for example, in China, and clothing in Kyrgyzstan and even in China. But there are many household items that are ingrained in the culture of the people who created them. Their originality is inimitable. Talk of cheap labor in China is just another myth. In Russia, outside the capital, people earn no more than ordinary citizens in China. The key lies in the organization of production and economic policy. In the People's Republic of China, the interests of the people and the country truly come first. Economic activity in China has a clear focus, and this focus is political. In the Russian Federation, economic gain is elevated to an absolute criterion, which is absurd, as the economy is not the goal of social development, but merely a means to it. In China, producers are maximally protected from attacks; the law serves as their "protector." The procedure for communicating with buyers (customers) is extremely simplified, significantly reducing transaction and order fulfillment time and minimizing non-production costs. Market relations are brought closer to normal operating conditions. Russian laws regulate the market space. The market space is a legally formalized reality, conventionally constructed according to the formula "this is how it should be," but this does not necessarily mean that this is how it is or will be. The real market reality is constructed as an environment of mutually conditioned coexistence between the producer, the seller (if this is not the producer themselves), and the buyer/consumer (the inclusion of resellers is highly undesirable). Market liberals led by Yevgeny Gaidar created an imaginary market, an ideal object outside of historical context, and therefore did not reform, but rather destroyed the country's economy. Yeltsin and his company, however, legitimized looting. The economy that escaped the shock was thrown like a bone from a master's table to common bandits, thieves, and swindlers. Only those who had the least regard for the law and conscience emerged from the economic hell of the 1990s alive, strengthened, and wealthy. This is why the economic collapse was followed by a spiritual crisis that continues to this day. Russia has always been strong in the spirit of its provinces. The capitals accumulate the spiritual strength of the outskirts. It is these forces, like springs and small rivers, that give birth to greater ones. The current prosperity of Moscow and St. Petersburg should not be misleading. Real life goes on in the vastness of the country. 140 million Russians still live and work where our true national strength is concentrated. What inspires optimism? Strength of character. Foreign scientific colleagues asked Zh.I. Alferov, "Are you an optimist?" He replied, "Yes, and my optimism is invincible." "Why?" came the next question. "Because," the renowned physicist explained, "there are more and more optimists around me. The pessimists have moved to your countries. Congratulations." The authorities refuse to acknowledge the specific nature of the Russian model of unstable demand for mass-market products: footwear, clothing, food, furniture, and household items. In Europe, the US, and Canada, during a crisis, the purchasing power of the majority of the population declines, and prices correspondingly fall, at least partially compensating for the satisfaction of essential needs. Price dynamics for consumer goods in our country always point in one direction—upward. Fluctuations are certainly observed, but they're only visible in official statistics. A normal market can't change independently of production and consumption. The Russian market reacts to exchange rate changes, but again, only through price increases. It seems as if the market is being controlled by "puppeteers." This theory isn't indisputable, but it's logically perfectly plausible. The authorities remain inactive, explaining that the desire to use regulatory mechanisms will inevitably lead to market impoverishment and product shortages. The natural question: where will they go? There's no answer. Indeed, try explaining where Chinese, Turkish, and Latin American goods, as well as products from Poland, Hungary, Ukraine, Moldova, Azerbaijan, Uzbekistan, and the Baltic states, will go from the Russian market. Who else needs them? We need protection for our own producers who feed, shoe, and clothe us. Russians understood the advantages of domestically produced food products back in the last decade of the last century. The next step is improving the quality of light industry products. And the state can facilitate their consistent availability on store shelves. What needs to be done to achieve this? Develop a specific program and strictly monitor its implementation by officials. The program for bringing Russian manufacturers back to the market must include reciprocal steps from the state and businesses. Returning to the way things were made before is pointless. An internal restructuring of production is needed, and the market is beginning to feel it. Shoe and clothing companies have emerged in Russia that

supply quite competitive products. Consumers, however, are still more surprised to find such goods. Nevertheless, the process has begun, and it needs to be accelerated. Naturally, this isn't about additional funding for the industry. "Industry" is a collective term, encompassing achievements in product range, design, quality, and color. This general concept encompasses all manufacturers of specific products. Both those seeking to modernize production and those relying on more than their own resources are accustomed to asking the state for assistance. Only innovators deserve additional financial assistance; it is effective when targeted. We need to help preserve traditional folk crafts. They are technically and technologically conservative, and innovation is limited. The government responded to the appeal for assistance from AvtoVAZ and enterprises in St. Petersburg, the Urals, and the Far East, citing their city-forming and national importance. Everything is correct, except for one thing: what kind of patriotism or national pride can we talk about if Russians are clothed and shod by foreign manufacturers, and fed and watered by foreigners.

Main part

A great power begins with small things – with the realization that we can make everyday things ourselves just as well as anyone else. We are surrounded by small details, they are in everything, and their significance is not always fully apparent, but they are what shape our mood. Outdated VAZ products were exchanged for new cars, and the state subsidized the exchange. You can't trade in an old suit for a new one, and shoes that don't meet your requirements can't be returned to the factory. Another option is for the state to compensate buyers of domestic clothing and footwear products, say, 15-20 percent of the price. This specific form of protectionism will turn buyers toward domestic goods and help accelerate sales. It's no secret that Russian footwear consumers, unlike manufacturers, expect to wear their purchased goods for more than one or two seasons. Products will require updating and repair. Why not, following the example of branded service stations, establish a branded network to support the use of footwear and clothing? Repairs would be cheaper and better quality. Equally important, such service would enhance the manufacturer's reputation. The average buyer, buying domestically produced shoes for 1,500-2,000 rubles, naturally expects to wear them for a long time. Their options for repairs are limited: do-it-yourself, take them to a shoemaker, or go to a branded repair shop. It makes sense to consolidate repair shops, as this would reduce costs. The state should also shoulder the lion's share of the costs of organizing economic and industrial education. Brand-name foreign shoes aren't worth the advertised price, which is why sellers so easily run various promotions and markdowns. Uninitiated into the intricacies of the market, buyers naively believe that the price difference is proportional to the difference in product quality and save up, taking out a loan to avoid making a mistake. Advertising constantly reminds them, "A miser pays twice!" Next to designer shoes, there are fashionable, tastefully finished Russian products made from genuine leather, priced one and a half to two times lower, but who can explain why they are of the same quality? On the contrary, the advertising campaign financed by brand-name companies deliberately creates the impression that it is impossible to produce high-quality modern goods in Russian factories. A television program, "Habitatina," has launched, debunking myths about the health benefits of imported products. A similar program dedicated to the quality of light industry products is needed. Rospotrebnadzor regularly restricts food imports into the country due to exceeding the maximum permissible levels of harmful or hazardous ingredients. The dangers of Chinese-made shoes and clothing are only occasionally reported in Turkey, in connection with high-profile incidents. One can't help but wonder about the strangeness of this policy. Someone benefits from shielding the main competitors of domestic manufacturers. And, after all, it's hard to find fault. Lobbying in Russia is legalized and has become a lucrative business for officials, who hide behind global practices. It's difficult for disparate and still weak enterprises to resist a large-scale, well-established policy that facilitates the occupation of the Russian market by foreign producers. This is further facilitated by the abolition of mandatory product certification. This measure may be suitable for Western Europe, with its consumer culture, but not for Russia, which is inundated with counterfeit products from the most problematic manufacturers. There's no point in waiting for market tensions to subside; to reclaim a place in the market and gain stability, we need to act assertively and comprehensively, reviving the former Soviet experience of organizing work with potential consumers. Fortunately, economic development opens up prospects for such activities.

Practice is effective when its path is illuminated by theory. At first glance, turning to theory in the anarchic marketplace seems untimely. Fires require extinguishing, not speculation. It depends on the fire's severity. Sometimes it's also important to consider how to proceed, develop a plan, and identify possible scenarios for the process. As for market conquest, it's impossible to act without a systemic understanding of the situation. It would be too primitive and ineffective.

The 20th-century economy emerged as an economy of mass production. The organization of mass production was a remarkable achievement, providing access to material goods for a significant portion of humanity—goods became abundant and affordable. However, mass production also brought into sharp focus the issue of product quality.

Rising prosperity, educational development, cultural progress, and an expanding technical range of products have naturally shifted consumer interest toward the quality of products offered on the market. The issue of quality has transformed from a purely production issue into a socioeconomic and political one. "Large-scale crises in Japan and Germany in the late 1940s were overcome with the help of state policies focused on improving quality. The crises in the US and European markets that arose in the late 1980s and early 1990s forced not only individual corporations but entire countries—Sweden, Great Britain, and the US—to focus on improving quality as the only means of helping national economies withstand competitive pressures." Quality is a systemic characteristic of a product; it presents the product in its holistic form. In its most general form, "quality" is "that, as Hegel wrote, by losing what, a phenomenon ceases to be itself." It is reasonable to assume that the understanding of quality is conditioned by the nature of the phenomenon. Phenomena of natural origin, that is, those arising without human participation, are entirely objective and the quality of such phenomena is the exclusive result of their self-movement.

Phenomena originating from human activity are also objectively qualitative, but the objectivity of these phenomena is dualistic. To the natural foundation of a human-produced commodity is added an objectified component, typically a materialized expression of the creative component of labor—knowledge, considerations, feelings, skills—in short, what, taken together, is represented by the concept of the subject's qualified contribution to the process of transforming an object into a commodity. The quality of an object transformed into a commodity is shaped by the interaction of the natural, the humanitarian, and the social. Consequently, a person acquires a natural right to perceive the quality of a commodity within the system of their own, human, values. This allows us to draw a very important conclusion: the quality of natural phenomena is given, while the quality of created goods (products) is developed simultaneously with the development of the ability to perceive quality. The development of qualitative perceptions can be spontaneous and incidental, or directed and modulated. The renowned French artist E. Delacroix was once asked if he could paint a portrait of the Madonna in mud. Yes, he replied, but I need the appropriate background. Educating the consumer isn't just the consumer's responsibility. It's also a producer's opportunity to maintain a loyal customer base. While exploring the problem of product quality characteristics, we found no works devoted to a systems analysis of quality—an examination of it within the system linking production, market, and consumption. This approach offers the potential to answer the fundamental question: how to achieve stability in an unstable environment. The literature primarily examines the quality of product production. And in this area, theory has reached the stage of development required for practical progress in quality management. But this is clearly insufficient for managing enterprise operations while taking market volatility into account.

Demand for goods produced in the light and food industries (and elsewhere!) is determined not only by expert quality assessments conducted by the manufacturer or at its request. The fate of a product is decided at the intersection of the interests and financial capabilities of three parties: the manufacturer, the consumer, and the market that connects the first two. Specifically, it looks like this: each solves their own problem, but should not overestimate their status, remembering their systemic position, which obliges them to act with an eye on the potential of their "partners"—whether they are ready for the proposed solution. This is why it is so important today to anticipate practical steps with balanced assessments of the current situation. Manufacturers are traditionally concerned with how to ensure the highest possible conformity of their products to prototypes. In a mass production environment, this problem is quite costly, as it requires the organization of a dedicated, extensive service and, most importantly, the availability of a significant number of qualified workers. The Japanese, faced with the problem of supplying production with qualified workers, were forced to solve it in a rather unique way: they supplied their factories located in neighboring countries—Malaysia, Thailand, Singapore, and Indonesia—with the most advanced technology to minimize manual labor. Not everyone is prepared to follow Japan's example. Linear economic development would certainly have led to a dead end—mass production would have become extremely costly over time. No comprehensive mechanization or automation could save the situation, namely:

— Firstly, staff reduction would cause an increase in unemployment with all the ensuing social negative consequences;

— Secondly, skilled workers would still be needed in large numbers.

Salvation came from the nonlinearity inherent in the dialectic of progress. The economy of mass production had exhausted its usefulness and, like the next stage of a rocket, lost its necessity for existence. The economic paradigm had shifted. Irrational in various aspects—ecological, humanitarian, economic—mass production gave way to a "lean economy. " Production fundamentally changes its purpose. The traditional task of producing a large number of identical products that meet regulatory requirements, from which the consumer can select the most suitable ones, is replaced by the task of producing precisely the product a given consumer

needs, in the required volume, and within a specific timeframe.

A "thrifty" (sparing) economy focuses the manufacturer's attention on consumer sentiment. Manufacturers must study demand, find their niche within it, and "educate" their customers through advertising, education, and customer service.

The new economic philosophy brings together producers and consumers, emphasizing the dialectical nature of their relationship—opposites, but ones that exist only in unity. Initially, producers and consumers were essentially one and the same. The division of labor and increased productivity physically separated them, but the essence of their relationship remained unchanged. They are naturally intertwined and must be drawn closer together. The market has pitted them against each other, seeking to further distance them by complicating the system of spatial relationships with intermediaries, transportation, and other instruments. The task that unites producers and consumers is to maintain mutual awareness, to clear market superstructures, to become direct financial partners, and to reduce the financial burden on production. At the same time, in the system of market relations generated by the commodity economy, producers and consumers are opposed to one another, so their understanding of production quality and product quality partially overlaps. This is also important to consider when establishing a market presence, hoping to establish a lasting presence there.

Common attributes of product quality for both the manufacturer and the consumer include its usefulness, convenience, hygiene, ergonomics, resistance to deformation, ease of use, and fashionability. Unlike the manufacturer, the consumer is less interested in the quality of production, although, according to the logic of changing conditions, the "promoted," that is, enlightened, consumer should not completely ignore the technology and organization of production. The relationship between product quality and production quality is cause and effect, and this is quite understandable to the layman. For their part, the manufacturer risks being out of business if they underestimate the specific nature of consumer perceptions of product quality. E. Deming, the author of the classification of "fatal diseases" for the manufacturer, listed #1 among the seven deaths: "orienting production toward products that are not in demand in the market," that is, not in demand by the consumer; #2 is "emphasis on short-term profits and immediate advantages." In both cases, the manufacturer commits the same methodological error: they remove their activities from the system of relationships, making their "area" universal, and pay the full price for it. The consumer's perception of the quality of a consumer product is less objective than the manufacturer's. A conscientious manufacturer, accepting professional obligations, draws on scientific knowledge, independent expertise, and so on. The consumer, in contrast to the professional manufacturer, is generally an "amateur." Their views on product quality are, to put it simply, layman's, based not on scientific knowledge but on common sense. They are dominated by a pragmatic approach and subjective assessment. Theoretically, the manufacturer should always be right; in practice, otherwise there would be no normal market, which is why everyone knows the opposite: the buyer is always right.

The predominance of a pragmatic approach to product quality among consumers is a kind of cost in the relationships between key market participants. This must be accepted; otherwise, it seems impossible to build a system-forming link in market practice. The consumer, as a buyer, is limited by solvency. The manufacturer has certain theoretical resources, such as increasing sales volume, working capital, reducing expenses, etc. The consumer-buyer, however, has no real reserves—loans will only increase their costs, and in Russia, significantly. Based on their situation, the consumer evaluates product quality through the lens of the number of rubles quoted by the seller as equivalent to quality. Add to this the skepticism that the persistent refrain, "price equals quality," awakens in the buyer's mind. Price can be equivalent to quality only in specific cases. The market is home to a horde of middlemen.

"Quality" and "price" are fundamental concepts for both producers and consumers, but they are woven into systemic considerations differently depending on their opposing market positions. Each actor measures product quality based on their own status. A third actor in producer-consumer relations, and yet another "assessor" of product quality, is the market, which serves as an instrument for regulating producer-consumer relations. The role of the market has historically strengthened with the development of national economies and the emergence of transnational companies. The market, instead of being an episodic, time-limited instrument, has become a fully independent economic phenomenon. Market expansion was accompanied by its structural evolution, ultimately building a complex pyramid of direct and indirect participation; retail trade has expanded into wholesale; transactions have moved from the present to the future. A leader has emerged in the market—the financial market—which should be viewed as a symptom, as the financial market, by definition, is removed from the object, and quality is represented here in a generalized, conventional manner. "Product quality," from the market's perspective, is conventionally concrete. It is a sign of product liquidity. The product doesn't sit idle, meaning the desired quality has been achieved. The market doesn't care whether the consumer is truly satisfied with the product's quality. In the market, the "king" is not the buyer, but the seller, and the criterion

for quality is the time it takes to sell the product. What happens next? The seller isn't particularly concerned. This is why the "fatal disease" of striving for immediate results is so widespread. Nevertheless, the "market theory" of quality has a place and must be taken into account when determining economic policy. Production, consumption, and the market, which is the subject of their relations, are cultural phenomena; their historical specificity is conditioned by time and national and regional development patterns. The phrases "production culture" and "consumption culture" have long been firmly established in professional jargon, which cannot be said of "market culture." The difference is not difficult to explain. Production and modern consumption are based on scientific knowledge that reflects the objective order of things; the influence of cultural traditions can be easily traced in them. The history of the market is not so extensive, and the attitude toward the market is somewhat different in culture. The market of the 20th century and into the new century has undoubtedly absorbed elements of culture, yet it has proven to be an activity devoid of fundamental cultural values. The Russian merchants' motto, "Our goal is profit, but honor is higher!", took hold thanks to an inherent and culturally shaped deceit. Honest and conscientious sellers never lingered in the marketplace—it wasn't their place. If we consider the art of deception a cultural phenomenon, then the market is a form of reality, a culturally shaped form of mass deception. Everyone is deceived, always, and in every way. And deception in the art market is no less prevalent than in the theater, where deception also occurs in its own way. Subjective, with unstable, multidirectional dynamics, the market is difficult to predict. Attempts to forecast market behavior are unproductive precisely because of the inadequacy of objective, systemic indicators. Thus, the market's reserves, as a field for managing real quality, are limited, especially given the government's lack of willingness to actively intervene in the architecture of market relations. For a given enterprise (or, better yet, an association or group of enterprises), the prospects for promoting its products are tied to developing resources for understanding quality within the production framework—seeking a qualitative compromise and educating its customers. European and North American manufacturers find it easier to establish themselves in the market with their products. Experience in interacting with consumers has been accumulated over two or three centuries; consumers have come to understand the manufacturers, finding "their own" based on their interests and budgets; the market has balanced itself and adapted to legal requirements; the government does not exert pressure on the market, producers, or consumers, but where it is present, it does so harshly. Corruption, pressure, and monopolistic claims have not been eradicated, but the struggle is real, not merely decorative or sham, which significantly facilitates market accessibility and standardizes competitive conditions.

Consumer satisfaction with product quality is a key concern for European theorists and practitioners. The problem, in schematic terms, is simple: it's necessary to qualitatively satisfy the end consumer's need for a product. Upon closer analysis, this simplicity turns out to be conditional— composite. To achieve the desired result, it's necessary to construct a market ensemble consisting of product value (1), price (2), and consumer purchasing willingness. In this sense, the market truly becomes pivotal for economic development, with the caveat that it's not so much the market itself as the market status of the consumer. This emphasis on consumerism explains the focus of producers' economic policy. Consumers aren't simply a matter of waiting for them; they must be actively sought out and "converted."

Foreign analytical reviews have reported that avant-garde marketers representing large mass-market companies are proposing to significantly expand the format of consumer engagement, even to the point of discussing the recommended price for economy-class products. The idea is entirely reasonable and practically feasible without significant expense. Buyer conferences are ineffective here, but extensive promotions and advertising campaigns, including product displays, announcements of estimated prices, and requests for consumer feedback, are quite promising and can be effective. Modern buyers and their financial preparedness should not be underestimated, nor should they be forced to pay for a manufacturer's incompetent policies by inflating prices. Agreed prices are also not fatal to a company. There are always untapped resources—material science, technology, and organizational expertise—that a manufacturer can leverage to make the process profitable. A stable market position in an increasingly competitive and volatile environment comes at a price. Perhaps it makes sense to rationally modernize what's called "bargaining" in a bazaar-like "market." Product quality, in practical terms, is defined by its ability to satisfy the needs and expectations of a specific consumer. Product quality is comprised of a multitude of useful properties. The concept of "product value," new to economic theory, is defined as "the totality of the quality parameters expected by the consumer for the product they need." The "Consumer Satisfaction Tree" has been "grown" from the concept of "product value." Product value is determined by the degree of consumer need and the level of quality (the presence of the required characteristics). Purchasing decisions are also influenced by:

1. Buyer confidence in the supplier;
2. Trust in the manufacturer;
3. Information received from other consumers;
4. Accumulated experience of using a similar product.

Consumers make purchasing decisions by weighing the product's price against the expected costs. The higher the level of consumer satisfaction, the greater the business's growth opportunities and the more stable its market position. Before human interest in them emerged, quality, properties, and measure were merely objective natural characteristics of things and the processes of their formation and transformation. The accumulation or decrease of quantity led to a critical mass—the boundary of "qualitative quantity." Measure, characterizing the quantitative interval—the limits of quality development—warned that further change was only advisable in a different qualitative expression. Of course, quantity alone cannot transform into quality. New quality arises from the quality of the old. And the method of changing quality differs from the method of changing quantity. Quantitative changes are continuous, while qualitative ones, by definition, are discrete. The emergence of human activity significantly altered the understanding of quality and the associated characteristics of existence. Social-historical processes were added to the natural historical processes of nature's development. Man actively began to restructure the natural prerequisites of his existence, viewing them as the raw material base for the struggle for his own existence. One should never forget that the essence of man is *practical.* F. Engels was absolutely right when he asserted: man is, of course, a creative being, but before he can create and amaze, he must eat, drink, dress, put on shoes, and have a secure roof over his creative mind. He does not find what he needs ready-made in nature, so the foundation of human existence and progress will always be practical activity, material production in all its diversity, which, incidentally, is also determined by the diversity of human needs. To the two objective, natural dimensions of quality—natural properties and dimensionality—a third is added: an assessment of quality as projected by the needs of human existence, combining objective and subjective principles (Figure 1). The range of quality carriers has changed historically. Today, it includes, along with the quality of material objects, the quality of raw materials, semi-finished products, the final forms of commercial products, software, phenomena of spiritual culture, the creative activity of people themselves and the methods of preparation for it—the quality of education. Qualitative changes in the scope of the concept of “quality” due to the inclusion of new phenomena that require qualitative characteristics presuppose changes in the content of the understanding of quality.

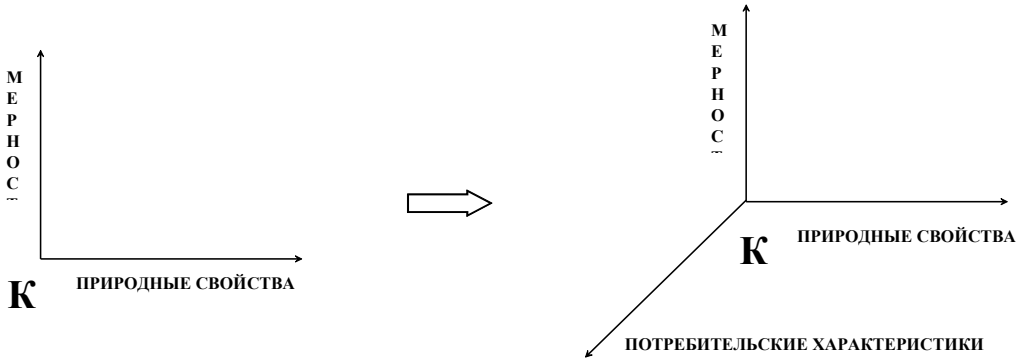

Figure 1. Development of ideas about quality measurement

It must be imbued with new, concretizing attributes. Even at first approximation, the inadequacy of extrapolating the qualitative characteristics of natural phenomena—for example, solar radiation—to the quality of raw materials, consumer goods, or services is obvious. At the same time, the set of basic characteristics of quality, expressed in its definition, remains invariant. The modern understanding of quality has gone beyond the traditional understanding of "quality" developed in classical philosophy, but this should not lead one to think that the philosophical definition of quality is outdated. Philosophy is a historical type of worldview, and its analysis of the fundamental characteristics of existence has universal significance. The philosophical definition of quality is a premise that must be adhered to in specific temporal or objective circumstances. Over time, it is not so much the philosophical understanding of quality that changes, but rather the view of quality in specialized and practical consciousness. Cognition ascends from general abstract ideas to a concrete understanding of world phenomena and their properties. This movement of knowledge does not negate the original understanding. On the contrary, we use it as a navigational device, charting our path in the world of current problems. In the system of philosophical categories, "quality" reflects the essential certainty of phenomena, thanks to which they appear as they do and not as others. The renowned German philosopher Hegel wrote: "Quality is that without which a phenomenon ceases to be itself." Defining quality as a system of essential properties of a phenomenon,

philosophy distinguishes two aspects of quality definition, allowing for the specification of general methodological characteristics. *Quality* characterizes both a set of similar phenomena and an individual phenomenon within a defined set. This differentiation is important in developing quality standards and is no less significant in terms of the validity of individual consumer claims. Another significant nuance in defining quality is that quality is not a collection of general properties of phenomena, but a system. Therefore, the exclusion or displacement of individual properties, for example, in a rating classification, is not permitted. Quality either exists or it does not. There cannot be less quality, and there cannot be more. Quantitative variations apply not to "quality," but to the "state of quality." The concept of " *quality state* "—or " *qualitative state* "—is key in developing specific scientific and industry-specific understandings of the quality of specific phenomena. Unlike the concept of "quality," which has an ideal meaning and serves as a reference point for developing precise standards, the concept of "quality state" is typically included in the development of regulatory provisions. The concept of "quality state" is developed at a level of knowledge that allows for the active engagement of specific and quantitative capabilities in determining quality. "Quality" is defined through properties. "Qualitative state" is characterized by both a specific set of properties and their quantitative assessment. Essentially, we primarily operate with concepts of quality state, implying quality as such. It should be otherwise in practical thinking, since it determines the actual objective process and its results. The contradictions of the world have laid many traps along the path of our knowledge. They prey on both the weaknesses of our psyche and the "inclinations" of our intellect. In the quest to understand quality, one-sidedness and inconsistency are especially dangerous. One-sidedness of knowledge manifests itself in the desire to put everything in its proper place—"on the shelves," according to the rule: "to each his own," "render unto God the things that are God's," and "render unto Caesar the things that are Caesar's." Philosophers develop a doctrine of quality, while others profit from the achievements of philosophy. When there is something useful, they praise; when there is not, they criticize. This position is convenient, allowing one to atone for one's own "sins" along with those of others.

Universal concepts of philosophy, including the category of "quality," are the timeless ideas of Plato, accessible only to philosophers. Philosophical concepts reflect the level of collective thinking, its achievements and shortcomings. The core of philosophical knowledge consists of concepts that synthesize specific cultural experience. The quality of philosophical knowledge is conditioned both by the quality of the philosophers' own understanding and by the creativity of representatives of all fields of scientific knowledge. It is practically possible, but logically impossible, to be a bystander to the formation of a modern worldview in which scientific generalizations serve as key elements. Consistency and diversity in understanding quality are equally important. The road from recognizing the need for a creative union between philosophy and science to translating this principle of knowledge development into tangible creativity is not an easy one. The general is hidden in the particular. It must be extracted, which is not easy in itself, and, moreover, not always necessary. In the interaction of theory and practice, the authority of the latter prevails. Practice urges solutions to its problems. The "fruitful" side of theoretical knowledge displaces the "luminous" one. Science, subordinated to practice, works "on the fly," squeezing the potential of existing theory. Fundamental research is frozen, yet only through it can a leap toward new materials, technologies—in short, a new level of quality in production and goods—be achieved. Not only in theory but also in practice, there is a pressing need for a synthetic concept of quality that would combine philosophical characteristics of quality with scientific insights and analytical production experience. *A quality ideology is needed* .

Quality ideology is a scientific and philosophical theory of quality with two main objectives. First, it should not merely analytically reflect the actual experience of creative human activity, but rather systematize the understanding of quality as a product of creativity. And, of course, quality ideology is intended to be more than just a mirror of socio-historical achievements; it should generate new ideas, guide progress, beginning with production, and control, regulate, and anticipate the relationship between supply and demand in the market across its entire spectrum. Analysts note a steady trend of increasing market demand for quality products. A significant shift in consumer interest toward product quality is observed, in terms of the specificity of time. However, this revelation was only a revelation because there is insufficient theoretical support for marketing forecasting. Mathematical models are "handy" tools. They are effective when sufficient experience has been accumulated to enable qualitative measurement of emerging market changes—that is, to follow rather than anticipate. Logical anticipation is necessary, as in genetics: given a combination of chromosomes, expect corresponding traits with a probability calculated using known formulas. The market's tendency toward quality goods was quite evident in the United States immediately after 1945. Americans at home, in Europe, and in Asia, rushed to buy anything of any value. Their interest in quality was driven by purchasing power, on the one hand, and an analysis of the international situation—the political pendulum had swung toward tensions between the

victors, on the other. Quality ideologists suggest a focus on national characteristics—national traditions, national ideas, the uniqueness of the natural habitat and relationship with nature, the specifics of crafts and industrial development, the social architecture of society, mores, and customs. The theoretical and methodological significance of quality ideology is enhanced by the fact that it will help overcome the limitations of current attempts to "rein in" quality. So-called quality management systems are, in fact, merely forms of organizing quality control over an activity or its results. Even the currently widely used system in the form of the international quality standard ISO-9000 contains only the most general provisions for quality management. The methodological basis of quality ideology is dialectics in both its epistemological meanings—as a general theory and as the logic of cognition. One must begin from the very beginning, without succumbing to psychological discomfort. The logical beginning of the theory has been and will be the search for an adequate definition of the system-forming concept. In the life of a concept, as well as the person developing the concept, two periods are distinguished: " prenatal " and "postnatal." The active life of a concept begins with its adequate definition.

A definition is the ultimate abstraction of scientific and philosophical knowledge, capturing the essence of a concept. It is very poor in content, appearing to be formal, "non-working" knowledge. However, it is the definition that carries a particularly significant load, systematically characterizing the concept. A definition indicates the belonging of the phenomenon reflected in the concept to a systemic series and simultaneously captures its distinctive features ("defining moments"). The defining moments of an entity include everything that constitutes its specific being. If all defining moments are collected together, then an entity passes from the mode of possible being to the mode of actual being. Examples include the definitions of well-known geometric figures: the trapezoid, parallelogram, rhombus, rectangle, and square. All of these figures have four angles and are formed by four straight lines. They are closed quadrangles, meaning they enter the system of closed polygons in this capacity and are defined by common features. The hierarchy of proper definitions is determined by the inclusion of additional (to necessary) attributes that concretize the content of the concept being defined. The square ranks at the top, as it comprises the greatest number of additional attributes. The definition of a square is the richest in content, but it is not identical to the concept of "square," as it does not capture all the geometric properties of a square and its relationships with other figures. Differences in understanding quality arise when individual constituent attributes or conditions for the existence of quality are removed and inadequately interpreted from the content of a concept that always represents a certain integrity. Quality is most often equated with a property, and conditions are included in the system of quality itself. To avoid confusion, it is necessary to strictly adhere to the definition of quality as the starting point in the system of its understanding. One-sidedness and errors in understanding the quality of a phenomenon have both objective and subjective roots. Quality, as an objective characteristic of a phenomenon, combines several of its fundamental properties, but the quality of a phenomenon manifests itself differently depending on its relationships with other phenomena, which allows us to speak of multi-qualitativeness. F. Engels wrote: "There are no qualities, only things that have qualities, and an infinite number of qualities at that." The various expressions of quality in the process of interaction of a phenomenon can be perceived one-sidedly. This is why the dialectical method of cognition requires that a phenomenon be considered in all the possible diversity of its connections. Only by adhering to this rule will one-sidedness of assessment be minimized.

The logic of the process of understanding quality also "disposes" one to inappropriate judgments. At the initial stage of cognition, the object of study appears as its individual properties. Cognition progresses from individual properties, through their comparison, evaluation, and differentiation, to the establishment of their relationships and the recognition of the unity of these relationships. Only at the systematization stage does the desired concept emerge. Cognition proceeds from "properties" to their unity—"quality," from "quality" to "quantity," and then to the idea of "quantity of quality," or "qualitative quantity"—"measure," expressing the relationship between "quality" and "quantity." The concept of "quality" has actively migrated from the system of philosophical categories to science and practical consciousness. Adaptation to new levels of thinking is presented in the Academic Dictionary of the Russian Language. Along with the philosophical definition, the authors provide three more, namely:

"An essential feature or property that distinguishes one object or one person from another (usually a positive feature or property)."

"The degree of dignity, value, suitability of a thing, action, etc., and its conformity to what it should be."

"The difference in value between a heavy piece and a light piece in a game of chess."

V.I. Dahl also preferred the broadest interpretation of quality – "a property or attribute, everything that constitutes the essence of a person or thing." Thus, *quality*, which, as experts argue, has become a system-forming factor in the modern economy, requires several aspects of analysis: *philosophical*, *scientific*, and *practical*. By balancing these approaches, we can count on success in developing a quality management system. First and

foremost, we must clearly and precisely answer the following questions: what do we mean by "quality"? and what is the distinctive nature of "quality of activity"? The latter is particularly relevant, as we face a specific task: building a quality management system applicable to a specific activity – higher professional education. Let us formulate the main provisions clarifying the preceding characterization of the concept of "quality," namely:

Firstly, quality is a system of defining properties of phenomena. Quality cannot be identified with any one of them, no matter how significant it may be. Quality can manifest itself through an isolated property, but even then it acts as a specific unity that cannot be neglected.

Secondly, "quality" and "quantity" are dialectically opposed concepts, that is, they exclude each other by definition, implying a mutually dependent existence. "Quantity" cannot directly transform into "quality"; it creates a condition that ensures the transformation of one quality (or qualitative state) into another. Likewise, "quality" does not transform into "quantity", but a new quality determines another quantity. This is where the desire to reveal quality through quantitative analysis arises. "The reduction of quality to quantity is the main tendency of modern natural science." Quantitative analysis of quality is rational within the framework of the understanding that it does not reveal a quality system. The quantitative approach to quality is limited by the function of the operator. Understanding "quality" requires a combination of quantitative measurements and qualitative definitions;

Thirdly, the concept of "quality," reflecting a diverse world of objects, must reflect this objectively existing distinction. Therefore, it is structured. The structuring of "quality" is particularly significant for the development of a quality management system. It is advisable to distinguish the following structural levels of quality, namely:

— quality of natural material;
— quality of recycled natural material;
— quality of the technical product;
— quality of the software product;
— quality of activity.

Comparing the presented levels in the quality structure, it is easy to see that their primary difference is determined by the presence or degree of involvement of conscious activity. As activity increases, the status of quality shifts from "materiality" (objectivity) to "ideality" (consciousness). The growing trend of transition from naturally occurring (spontaneous) properties of quality to consciously defined characteristics of quality is quite obvious. This shift reaches its highest embodiment at the level of the quality of the activity itself. At the same time, we note that quality at all levels remains an objective characteristic of the process (phenomenon); therefore, arbitrarily defining quality properties is counterproductive. It is necessary to consider objective reality, of which our conscious activity is a part. The power of knowledge lies in its objectivity. Quality is ensured only by activity that is itself qualitative, that is, based on the skillful use of objective knowledge. Such activity is commonly defined as "professional." The most important scientific conclusions of the 20th century about the "noosphere," the "transformation of science and culture into a direct productive force for society," and the "growing role of the subjective factor in history" reflect a spectral shift in the structure of quality toward the quality of activity, actualizing a complex set of quality management issues. The system-forming feature of professional and educational activity is synthetically represented by the concept of "education." The concept of "professional" serves as a vector. "Education, the process and result of the assimilation of systematized knowledge, abilities, and skills... it is closely linked with upbringing." Education combines training and upbringing. Training and upbringing, in principle, are interrelated in themselves. Education gives their relationship a certain integrity and direction. Education is meaningless to interpret outside of ideology. It is not education that needs to be "cleared" of ideology. Ideology needs to "clear" the rubble created by apologists and critics of the bourgeois system of social relations. The ideology of education—general and professional—is based on two key principles: the need for systemic learning to ensure that the power of knowledge is positively oriented, and the importance of cultivating a need for systemic knowledge. Otherwise, the active phase of learning will be limited to the time spent in educational institutions. It is advisable to consider the quality criteria of higher professional education in both theoretical and practical aspects. Ideally, both aspects should be two sides of a single process, namely:

- in theoretical terms, the criteria for the quality of a university's activities look like a "docking point" of the State Standard;
- personal satisfaction of the graduate;
- the conjuncture demands of the domestic consumer and the different levels of requirements of the international labor market.

Combining such diverse approaches is only possible within a highly flexible and relatively specific "specialist" model. The practical plan is more precise. Modern, effective teaching technologies, highly qualified personnel, rational management, and sufficient funding are essential.

Instead of drawing conclusions, let's summarize and define the basic concepts of quality ideology. The development of quality ideology begins with identifying and defining the essential properties of the many phenomena whose quality we must understand and evaluate.

The concept of "essential properties" reflects a group of attributes that characterize the structural and functional features of a given set of phenomena. Essential properties determine the status and functioning of both individual phenomena and the set as a whole. The absence of even one such property indicates a lack of qualitative certainty for the phenomenon.

The difficulty lies in determining the essentiality of a property. Any standards intended to provide clarity are arbitrary and subjective, allowing for the manipulation of quality as a characteristic of a phenomenon, thereby substituting quality. With regard to the quality of the product of an activity and the activity itself, such manipulation is primarily associated with the sequestration of the nomenclature of essential properties. For example, footwear must ensure safety and comfort of movement. Aesthetic and hygienic components are packaged within the definition of basic functions, which is entirely acceptable, as defining a qualitative characteristic requires maximum conciseness. However, what is synthesized and included in the definition of quality can be manipulated arbitrarily. It's no secret that materials certified as environmentally friendly in general are used legally and especially illegally in footwear production on a significant scale, but not in our specific case. It's incorrect to divide footwear into high-quality and low-quality. Low-quality footwear is, by definition, not footwear, but a substitute, a semblance, a counterfeit. What is to be done? It is irrational to determine the real situation based on formal criteria, and even more so to take into account the actual practical order in force.

To bridge theory and practice, it is useful to differentiate the concepts of "quality" and "state of quality" in quality ideology. The concept of "quality" emphasizes the systemic relationship between the essential properties that constitute the certainty of a set of phenomena. Quality, as the ultimate characteristic of certainty, characterizes this set of phenomena formally and fundamentally.

The concept of "quality state" reflects a specific level of expression of the quality of phenomena. In this sense, it is more meaningful and captures the actual state of affairs. A quality state can be incomplete and conditionally defined.

The concept of "quality levels" concretizes the understanding of quality in terms of the world's development, its increasing complexity, and the growing importance of rational and practical activity. The ideology of quality applies specifically to specific quality levels, or, more precisely, it is determined by their specific status and internal differentiation.

The historical development of the main types of footwear was directly related to the natural socio-economic conditions of the era, the aesthetic and moral demands of social life, and the prevailing artistic style. Artistic style is a historically established, relatively stable commonality of the figurative system of means and techniques of artistic expression, conditioned by a unity of ideological content. In clothing, a general stylistic direction is expressed in basic forms and proportions, the method of wearing, the use of certain materials and their color combinations, the nature of the use of auxiliary materials, fittings, and jewelry. Changes in the overall artistic style of an era are always associated with major ideological and social shifts. These shifts occur over a long historical period. However, within *each style*, there is a more fluid and short-lived phenomenon— ***fashion*** —that touches all areas of human activity. The word "fashion" comes from the French " mode," which in turn goes back to the Latin modus, meaning measure, manner, or method. According to V. Dahl, fashion is a temporary, changeable whim in everyday life, society, and clothing cut and attire. Another definition is often encountered: ***fashion is the short-term dominance of certain forms, linked to a person's constant need for variety and novelty in their surroundings. Fashion*** is particularly noticeable and active in clothing, which is subject to the most frequent changes in volumetric, planar, and linear forms. Some experts, fashion trendsetters, believe that the birth of fashion is difficult to associate with *any specific* period or event. Perhaps this is as uncertain as its end. However, on the other hand, the most important characteristic of fashion is its *inevitable changeability*. With the advent of a new fashion, shoes, like other items of clothing characteristic of the previous fashion, partially or significantly lose their aesthetic value, and with it, their monetary value. This fact has significant aesthetic and economic significance for producers and consumers. Some are reluctant to buy, while others have experienced a sharp decline in demand for these types of footwear at an inopportune time. They have failed to introduce new, fashionable footwear to the market in a timely manner, thereby maintaining high demand and the image of their company as a trendsetter with a marketing department that monitors demand and makes timely, effective decisions. Unfortunately, manufacturers fail to understand that this loss of aesthetic value in the footwear offered to customers stems from people's natural desire to update their wardrobes, which is linked to constantly changing needs (including aesthetic ones) and the overall development of human society. A company's operations without taking into account the current market demand today, or better yet, tomorrow, will inevitably lead to failure, because *fashion is both novelty and imitation*— not always new, but always unusual, with the expression of each consumer's individuality. One cannot but agree with the statement of the famous French artist and fashion designer Pierre Cardin about fashion: "Fashion is renewal! A principle that nature has always followed! A tree sheds old leaves, a person sheds boring clothes and

shoes. When things become familiar, people quickly tire of them. Fashion saves us from tiresome uniformity. People want to please each other: being well-dressed and looking good is a natural need."

A modern leader must possess that instinct, the ability to anticipate this emerging new trend, something that's already in the air but hasn't yet taken shape. This skill requires learning, taking risks, surrounding oneself with talented fashion designers, trusting them, implementing their proposals and designs in small batches, testing them in demand, promoting the advantages of the offered footwear range, and cultivating good taste in the buyer and their desire to be well-dressed and look good. This doesn't happen automatically. This state of mind is shaped by the environment in which a person communicates, lives, creates, and desires to be recognized. Taste must be developed, but at the same time, every buyer, every member of society who considers themselves cultured, must have taste endowed with individual qualities. Only then can ***fashion*** fulfill its mission—*to make each person an individual*. This is possible if people develop diverse personal tastes, if a society is created that respects the tastes of others without imposing its own, coexisting peacefully, and forming a society of intelligent, cultured individuals. Unfortunately, the level of quality in Russian industry and services still does not meet these requirements. The few examples of successful competition by Russian companies in foreign markets have largely been achieved through the low cost of raw materials, energy, and labor. After Russia's accession to the WTO, Russian companies will no longer have these advantages. They will be able to compete with global manufacturers solely on the basis of high-quality products and technological processes, their ability to meet market demands, and the availability of a sought-after range of footwear. One of the most important steps in achieving these goals was the adoption of Federal Law No. 184-FZ "On Technical Regulation" on December 27, 2002. This law lays the foundation for a radical reform of the entire system of state quality regulation. The Federal Law "On Technical Regulation" (hereinafter referred to as the Federal Law) provides for the harmonization of Russian *approaches to conformity assessment, the standardization system, and state quality control with European practices.* The ongoing technical regulation reform is aimed at ensuring the necessary balance between the interests of consumers and manufacturers in the marketplace. This requires, on the one hand, ensuring the safety of products for people, their property, and the environment. On the other hand, the process of product distribution to the market (conformity assessment and confirmation, quality control and supervision, etc.) helps prevent actions that mislead consumers. It is well known that only those countries that are able to ensure the quality of their products and services, creating a competitive advantage for their producers and a comfortable living environment for consumers, achieve a leading position in the global economy. Therefore, in leading countries, the issue of quality is at the center of the economic interests of the state and its citizens. Quality systems, being a market-based quality management mechanism that enterprises apply at their own discretion, require state support.

One of the key steps in government support for quality systems was the 1998 Russian Government Resolution "On Certain Measures Aimed at Improving Quality Assurance Systems for Products and Services." It stated, in particular: "Consider the most important task of federal executive bodies to support business entities implementing quality systems based on GOST R ISO 9000 series in order to enhance the competitiveness of their products and services. Recommend that executive bodies of the constituent entities of the Russian Federation provide support to these business entities." As a result, by placing lucrative contracts, the government is encouraging industry to develop and utilize effective tools for improving product quality, such as modern quality systems, i.e., the new version of ISO 9000:2000. A quality system according to the new version of ISO 9000 series standards ensures the quality required by the consumer, but at minimal cost. This, in particular, underlies the philosophy of the TQM (Total Quality Management) concept and, consequently, the high effectiveness of the enterprise's quality system. Under these conditions, the company that can offer consumers the best quality at a lower price will gain an advantage. The quality system must ensure both product compliance with consumer requirements and the guaranteed identification and elimination of deficiencies in production processes that affect quality, i.e., ensure the highest probability of eliminating defects. However, more than a year has passed since the Federal Law came into effect, and during this time, not a single technical regulation establishing mandatory requirements for the objects of technical regulation has been adopted in the country.

Technical regulation is the legal regulation of relations in the area of establishing, applying, and enforcing mandatory requirements for products, production processes, operation, storage, transportation, sale and disposal, performance of work, or provision of services, as well as the legal regulation of relations in the area of conformity assessment. According to Evgeny Petrosyan, Deputy Director of the Department of Technical Regulation and Metrology of the Ministry of Industry and Energy of Russia (formerly Gosstandart), this state of affairs with Federal Law enforcement is due to confusion in the standardization sphere following the unsuccessful implementation of administrative reform. Marina Glazatova, Director of the Department, essentially agrees that the unsuccessful administrative reform has delayed standardization reform, as it will take a year

for the Russian Government to formulate its key objectives. However, three key issues need to be addressed today:

— *Clarify the provisions* regarding mandatory conformity assessment during the transition period. An amendment to Article 46 of the Federal Law is needed. This amendment should guarantee the mandatory implementation of all forms of conformity assessment that currently exist and establish the legitimacy of both certificates and declarations during the transition period. Currently, such a document does not exist, as the laws on certification and standardization have been repealed;

— *Clarify the provisions* for registering certificates and declarations of conformity. According to the Federal Law, registration must be handled by the federal technical regulation authority, i.e., the ministry. However, it is physically unable to handle such a volume of work, so this issue was resolved by preserving the right to register locally with standardization and metrology centers. However, the fate of the standardization and metrology centers themselves, as federal government agencies, is still unclear.

— *Clarify the procedure* for developing rules and methods for conducting tests, measurements, and sampling. According to the Federal Law, all methods must be approved by the government. However, given that there are six and a half thousand standards, this seems unrealistic. The Department proposes transferring this work to the level of approval of national standards, i.e., to the Federal Agency. However, the issue remains open because the Federal Law stipulates that the rules and methods approved by the government will then be used for monitoring and oversight during inspections. This means that the parties will know in advance exactly how and by what methodology the inspection will be conducted. This will make the process of monitoring compliance with technical regulations more transparent.

Conclusion

However, the meaning of these claims is rather the opposite: while "private" projects are guilty of incompleteness and extreme laxity in the requirements put forward for products, "state" ones strive to regulate everything possible, and to such high standards that it is unclear who will be able to comply with them. Although *technical regulations* are adopted only for the purpose of ensuring the protection of the life or health of citizens; the property of individuals or legal entities, state or municipal property; environmental protection, and the prevention of actions that mislead purchasers. The use of *technical regulations* for other purposes is not permitted. Since, according to the Federal Law, *technical regulations* are divided into general and special, in this case the requirements *of general technical regulations* are mandatory for all types of products, production processes, operation, etc. They are adopted on issues of safe operation and disposal of machinery and equipment, safe operation of buildings, structures, constructions and adjacent territories, fire, environmental, biological, nuclear and radiation safety, electromagnetic compatibility, while *special technical Regulations* establish requirements for individual types of products, production processes, operation, etc. To ensure compliance with technical regulations, the Federal Law provides for two types of standards: national standards, adopted and approved by the national standards body, and enterprise (organization) standards. Currently existing industry standards will no longer exist; they must be upgraded to national standards or organizational standards. Consequently, ***a standard*** is a document that, for the purposes of voluntary multiple use, establishes product characteristics, implementation rules, and the characteristics of production, operation, storage, transportation, sale and disposal processes, performance of work, or provision of services. A standard may also contain requirements for terminology, symbols, markings, or labels, and the rules for their application.

References:

1. Porter, M. (2025). *Competition* / - Moscow: Publishing house. Williams house, 2025 - 608 p.
2. Glushakova, T. (n.d.). *Measurements of consumer satisfaction and enterprise management* / - Retrieved from http:\\www.quality.eup.ru
3. Efimov, V. (2025). *Types consumer values products* / Moscow: Standards And quality - 2025 - No. 5.
4. Karsavin, L. P. (2025). *Philosophy stories*/ - St. Petersburg: JSC "Set".
5. Knorring, V. I. (2024). *Theory, practice and art management* / -- city Moscow: NORM-INFRA.
6. Salimova, T. A. (2024). *Diversification management quality* / - Saransk: Mord Publishing House. University.
7. Shadrinsk, A. D. (2025). *Five needs, eight principles, Ten Commandments* / Moscow: Standards and Quality, 2025 - No. 2.

8. Rebrin, Yu.I. (2024). *Quality management* / -- Taganrog: Publishing house of TRTU, 2024, 174 p.
9. (2025). *Efficiency and Quality Management*. Modular program/in 2 parts - part 1. Moscow: Delo, 2025 - 800 p.
10. Feigenbaum, A. (2025). *Product quality control* / -- Moscow: Economica, 2025, - 471 p.
11. Salimova, T.A. (2025). *History of quality management* / - Moscow: Knorus, 2025, 256 p.
12. Ponomarev, S.V. (2024). *Product Quality Management. Introduction to Quality Management Systems* / - Moscow: RIA "Standards and Quality", 2024, 332 p.
13. (2025). Imai, Masaaki Gemba Kaizen: *The Path to Cost Reduction and Quality Improvement.* / - Moscow: Alpina-Business-Books, 2025 - 346 p.
14. (2024). "*What is Six Sigma? A Revolutionary Method of Quality Management"* / Moscow, Alpina-Business-Books, 2024, 158 pages.
15. Womack, J.P. (2025). *Lean Manufacturing: How to Eliminate Waste and Make Your Company Prosper* / - 2nd ed, Moscow: Alpina - Business - Books, 2025, 473 p.
16. George L. Michael (2025). *Lean Six Sigma: Combining the Quality of Six Sigma with the Speed of Lean Manufacturing* / Moscow: Alpina - Business - Books, 2025, 360 p.
17. Singo, S. (2024). *Fast changeover: revolutionary technology for production optimization* / - Moscow: “Alpina - Business - Books”, 2024, 344 p.
18. Vader, M. (2025). *Lean Manufacturing Tools: A Mini-Guide to Implementing Lean Manufacturing Methodologies* / Moscow: Alpina - Business - Books, 2025, 125 p.

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	GIF (Australia) = 0.564	ESJI (KZ) = 8.100	IBI (India) = 4.260
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Issue Article

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FORECASTING QUALITY COSTS IN THE DEVELOPMENT OF A NEW AND IN-DEMAND ASSORTMENT OF FOOTWEAR BY CONSUMERS IN RUSSIAN REGIONS

Abstract: *In their article, the authors realized that an integrated approach to managing the quality of materials and products remained a mystery. The reason is simple: most authors had only planned such research but hadn't implemented it due to its complexity. Now, this problem is solvable because it's manageable and offers the opportunity to take a step toward philosophical solutions. It might not all work out, but we decided to take the risk.*

Key words: *Integrated approach, quality management, philosophical shore, materials, finished products, Hedgehog in the Fog, comprehensive research, worldview, methodology.*

Language: *English*

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Introduction

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To a large extent, the uncompetitiveness of domestic footwear was due to flawed methodology for measuring and evaluating its quality. The problem lies in a certain discrepancy between the quality assessment of footwear, as designed during the development stage, formed during production, and verified during the final inspection before sale, and consumer quality assessments. The gap between actual quality and consumer expectations significantly

impacts consumer preferences and, consequently, competitiveness. The smaller this gap, the greater the competitiveness of footwear. The difficulty lies in the fact that when evaluating footwear quality, consumers rely largely not on quality indicators regulated by regulatory documents, but on their own tastes and perceptions of what footwear should be. Moreover, many consumers' perceptions of quality are sometimes superficial, relying primarily on organoleptic indicators, which do not always adequately and objectively characterize footwear.

Very often, the need to assess competitiveness arises even before a new product is launched, i.e., during the design and development stages. This is because the level of costs during the consumption and use phases is more than 80% dependent on the footwear characteristics established at various stages of its development. During the detailed design and prototype development stages, the designer can reduce these costs by no more than 15%, and once the product is in production, the change can be as little as 5%.

Therefore, at the pre-design stage of new product development, a multi-variant forecast must be developed, providing information on the potential technical feasibility and timeframe for achieving the identified goal. Therefore, researching consumer demand for footwear is crucial for improving the quality and competitiveness of manufactured products. It is essential to determine the criteria by which customers evaluate quality, as they will seek to purchase footwear with the desired combination of properties.

In order to evaluate the significance of consumer quality indicators for footwear at the design, production, and sales stages, we used an expert method of personal assessments—ranking—which allows us to sufficiently take into account the opinions of both shoe manufacturers and potential consumers.

Main part

Experts are asked to rank a set of factors that determine the consumer quality of footwear. The initial rankings are first transformed as follows:

$$Rj = \sum_{i=1}^{m} rij, \quad (1)$$

Where Rj is the sum of the transformed ranks across all experts for factor j; rij is the transformed rank assigned by the i-th expert to the j-th factor; m is the number of experts; n is the number of factors. The factor weights are then calculated:

$$Wij = \frac{r_{ij}}{\sum_{i=1}^{m} r_{ij}} \quad (2)$$

$$Wj = \frac{\sum_{i=1}^{m} W_{ij}}{\sum_{i=1}^{m}\sum_{j=1}^{n} W_{ij}} \quad (3)$$

Where W j is the average weight of the j-th factor across all experts.

A group of 100 experts was divided into two groups for the survey: consumers and manufacturers. A number of requirements were imposed on the survey participants from the manufacturer group:

— special education;

— position held;

— work experience.

Leading specialists from footwear companies in cities across the Southern Federal District, including Shakhty, Rostov-on-Don, Krasnodar, Volgograd, and elsewhere, were recruited to identify experts. Faculty from the Department of Leather Products Technology, Standardization, and Certification at the South-Russian State University of Economics and Service were also engaged as experts. The experts ranked the indicators by importance, i.e., their impact on footwear quality, in the questionnaire. Women's footwear—boots for the fall and spring seasons—was chosen as the subject of the study.

During the survey, experts were given a questionnaire containing factors influencing the quality and competitive advantages of footwear at the design, production and sales stages (Table 1).

Table 1. Questionnaire form

Factors	Rank
1	2
Shoe design stage	
X1 – compliance with fashion trends	
X2 – shape of the toe part	
X3 – heel shape	
X4 – heel height	
X5– sole thickness	
X6 – shoe upper blank design	

X7 – model design	
X8 – color scheme	
X9 – shoe flexibility	
Stage of shoe production	
X1 – type of upper material	
X2 – type of bottom material	
X3 – quality of connection of upper parts	
X4 – quality of execution of the shoe upper blank	
X5 – toe stiffness	
X6 – heel stiffness	
X7 – strength of fastening of bottom parts	
X8 – bottom finishing quality	
The stage of footwear sales	
X1 – attractiveness of appearance	
X2 – novelty of the product	
X3 – mass of shoes	
X4 – price	
X5 – brand prestige	
X6 – advertising	
X7 – service services	
X8 – packaging quality	

Respondents were asked to arrange the factors in descending order of their influence on the quality and competitiveness of footwear (rank them), i.e., the factor that the expert considered the most important received a higher rank – 1, and the others – in order of decreasing influence on the competitive advantages of footwear, i.e., 2nd, 3rd place, etc. If the expert could not decide on the assignment of a place for two or more adjacent factors, then he assigned them the same rank.

The expert survey results were processed on a personal computer using the specialized program "RANG." The distribution of ranking results indicates that the opinions of consumers and manufacturers serving as experts coincide on many points. Significant quality indicators were established during the design stage:

compliance with fashion trends – X1;
toe shape – X2;
heel shape – X3;
heel height – X4;
shoe upper blank design – X6;
model design – X7.
Less significant:
color scheme – X8;
shoe flexibility – X9;
sole thickness – X5.

After statistical processing of the results of the expert survey, it turned out that all of the above factors remained significant.

At the production stage, the following factors are significant for producers and consumers:

type of upper material – X1;
type of bottom material – X2;
quality of connection of upper parts – X3;
quality of execution of the shoe upper blank – X4;
strength of fastening of bottom parts – X7;
back stiffness – X6;
Bottom finish quality – X8.

At the implementation stage, the following are significant indicators of footwear quality for all experts:

attractiveness of appearance – X1;
novelty of the product – X2;
price – X4;
shoe weight – X3;
brand prestige – X5.
Less significant – advertising – X6;
service services – X7;
packaging quality – X8.

To forecast quality costs taking into account consumer requirements when developing a new range of footwear, based on the results of an expert survey at the design stage, it is necessary to determine the weights of all significant factors using formula (4).

Let us assume that the costs of improving the quality of one unit of production for each factor are known, which are determined by the vector: p(p1, p2, pn). (4)

Then we can determine the expected costs of changing the quality of the designed product:

$$M(X)\ p1w1\ p2w2...\ pnwn. \quad (5)$$

This method of estimating expected costs can be used at the stages of production and sales of products.

The conducted research covers the entire spectrum of consumer and production requirements for footwear, affecting its competitiveness, and also allows for the forecasting of costs for improving quality at all stages of the product life cycle and should be taken into account by manufacturers when developing their footwear assortment.

In many industries, when preparing for mass production of new products, a comparative evaluation is necessary to decide on the manufacturing sequence or select one from a range of designed products, as well as for highly effective advertising and presenting the product's technical advantages to buyers. In common practice, this task is accomplished through expert product assessment by specialists using difficult-to-compare technical and economic indicators with different levels of significance and measurement units. For example, products may have different weights in kilograms, costs in grams, or air permeability in dm^3/m^2 s. Finding the specifics of product assessment is achieved through a complex compromise that compromises the specificity of each indicator, introduces subjective "importance" factors that are often criticized, and so on, which are difficult to justify and prove.

This part of the intellectual task can be solved more demonstrably in a human-machine system with a network architecture for product evaluation. For example, such an assessment can be obtained in a design preparation management system for light, food, and other industries by visualizing the overall product evaluation. Then, control is reduced to choosing a trajectory in the multidimensional phase space of product properties that best satisfies the criteria of the complex system's primary function (e.g., market penetration, production, and sales of all products within a specified timeframe). In traditional systems analysis, such problems are formalized by decomposing the complex system into a selected number of subsystems. However, in this case, the connections (relationships) between the subsystems lack a topology; they are formally separated. This can be compensated for by a formalization method that identifies connections (relationships) using the mathematical apparatus of set theory and general topology, and, in particular, the model of a fluctuation parameter capsule. Implementing such a comparative analysis of a number of products and identifying priorities is relatively simple (Figure 1).

The entire information field is divided into planes by four lines, forming eight vectors and eight zones (there may be a different number). Information about each of the eight properties selected in our example is plotted on the lines. In this case, for footwear characteristics, demand is the cost price, weight and flexibility, vapor permeability and moisture absorption, and aesthetic properties (scores) are environmental (sanitary) pollution from non-natural materials. The obtained experimental numerical data are plotted on the graph's rays if they are available in natural units of measurement, for example, cost in hryvnias, weight in grams, and demand and aesthetic properties in scores assigned by experts. The resulting visual representation of a complex system, represented as a polygon, allows a designer or buyer to make the right decision regarding the comparative evaluation of different product models, ranking them into a preferred order by comparing the areas of the polygons. This figure contains a range of other information in addition to visual information. For example, the areas of the figures enclosed between the rays and their sums reveal the advantage of the areas of "positive" indicators of high aesthetic properties and demand for flexible footwear over a product with greater weight, higher production costs, and less environmentally friendly artificial parts. Thus, in the example shown in Figure 1, the advantage in the combination of the two indicators is with sample #1, which has a larger total area in the "positive" sectors of the properties. This is an effective visual advertising technique that helps select a sample with superior "overall" properties, which are difficult to compare.

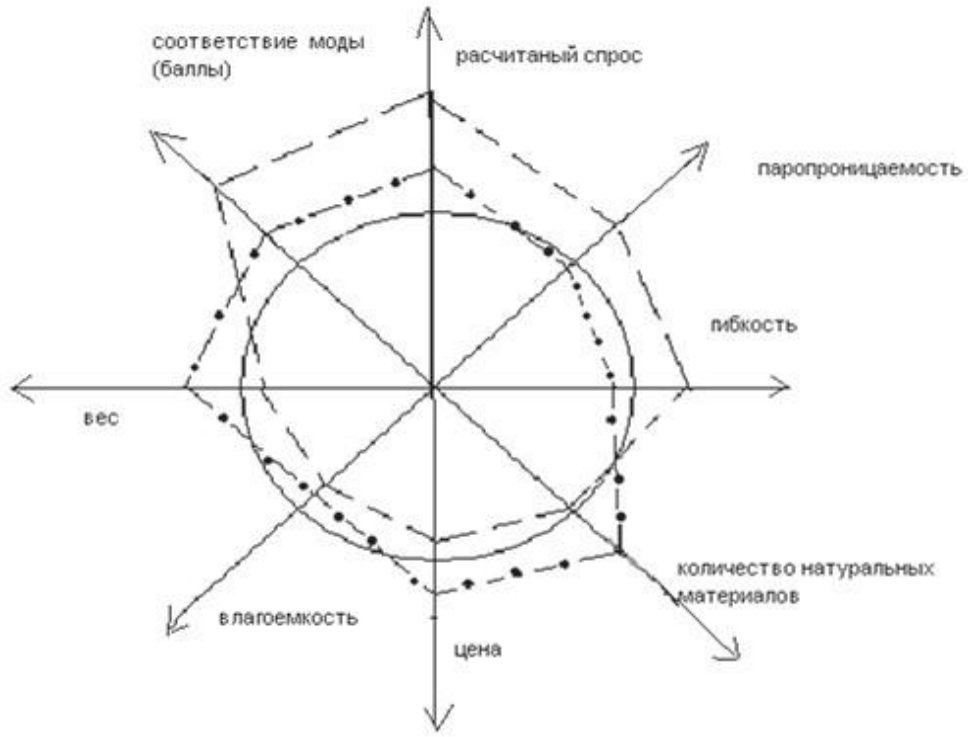

Figure 1. Summary properties for a combination of indicators of shoe samples

This method for selecting the "best" product is relatively simple and straightforward, allowing for informed decision-making. This method can be used for technical and business evaluations of various products in industries such as consumer goods, food, electronics (for example, INFINITE, showcased at CEBT 2024), and others.

At the intersection level of the circle and the axes, the values of eight standardized indicators (if any) or averages for the assortment in their units are indicated; the data for each sample N1, N2, etc., plotted on the axes, are connected by straight lines.

Scientific and technological progress in the production of special footwear involves not only technological improvements, the development of advanced materials and automated equipment, but also the imparting of new useful properties, as well as the development of modern methods for assessing footwear quality and testing equipment. The creation of products with a higher level of quality, approaching and even exceeding Western standards, should be considered a key development area for domestic footwear production. It is essential to develop special footwear designs with an expanded range of properties and characteristics, which must be strictly defined and metrologically controlled. To improve the effectiveness of metrological quality assurance for special footwear in the near future, it is necessary to align these standards with international standards (ISO) in force in the EU (European Union) countries:

- nomenclature of measuring instruments and measurement accuracy standards; methods for performing measurements, testing and control;
- metrological certification and calibration of control, measuring and testing equipment.

In recent years, many domestic industry standards have ceased to meet modern requirements and require radical revision to ensure that the regulated and specified characteristics of footwear are in line with the latest global scientific and technological advances and take into account the development trends of the standardized objects. The globalization of the global economy necessitates aligning domestic standards, particularly for safety footwear, with international standards (ISO), which are more stringent and have a broader range of specifications. This is essential for companies seeking foreign investment, attracting foreign customers, and thus entering the Western market and effectively competing with Southeast Asian competitors.

To successfully implement domestic regulatory and technical documentation for safety footwear, reflecting summarized data on footwear quality and providing comprehensive evaluation methods that guarantee a high-quality product, it is necessary, first of all, to change the customer's mindset and bring it closer to the Western one. The philosophy of Western customers who purchase safety footwear for their company's employees is as follows: If an employee feels comfortable wearing the footwear and experiences no unpleasant or irritating sensations when their foot contacts the shoe, they are not

distracted by these factors, therefore, their attention is not distracted, they make fewer mistakes at work, experience less fatigue, and their productivity and quality of work increase. Unfortunately, our entrepreneurs view safety footwear for employees radically differently. They prefer to minimize this expense at the expense of quality, forgetting that of all costs, the greatest return comes from investments directly directed at personnel and improving their working conditions. The modern approach to the creation of safety footwear, used abroad, is characterized by three essential conditions under which footwear must meet: namely, providing the stated comfort.

These latter requirements are rarely met in domestic special footwear, and our safety testing methods need to be significantly expanded.

The aesthetic component is missing here, the necessity of which is dictated by the requirement to create an attractive appearance for special footwear, which is especially important for female personnel, otherwise it will be a negative irritant for the wearer.

The difference in approaches to the creation of special footwear is clearly demonstrated by a comparison of international ISO and Russian standards (ISO 20344:2004 and the Russian standard "Special footwear and materials for the upper and lower parts of special footwear").

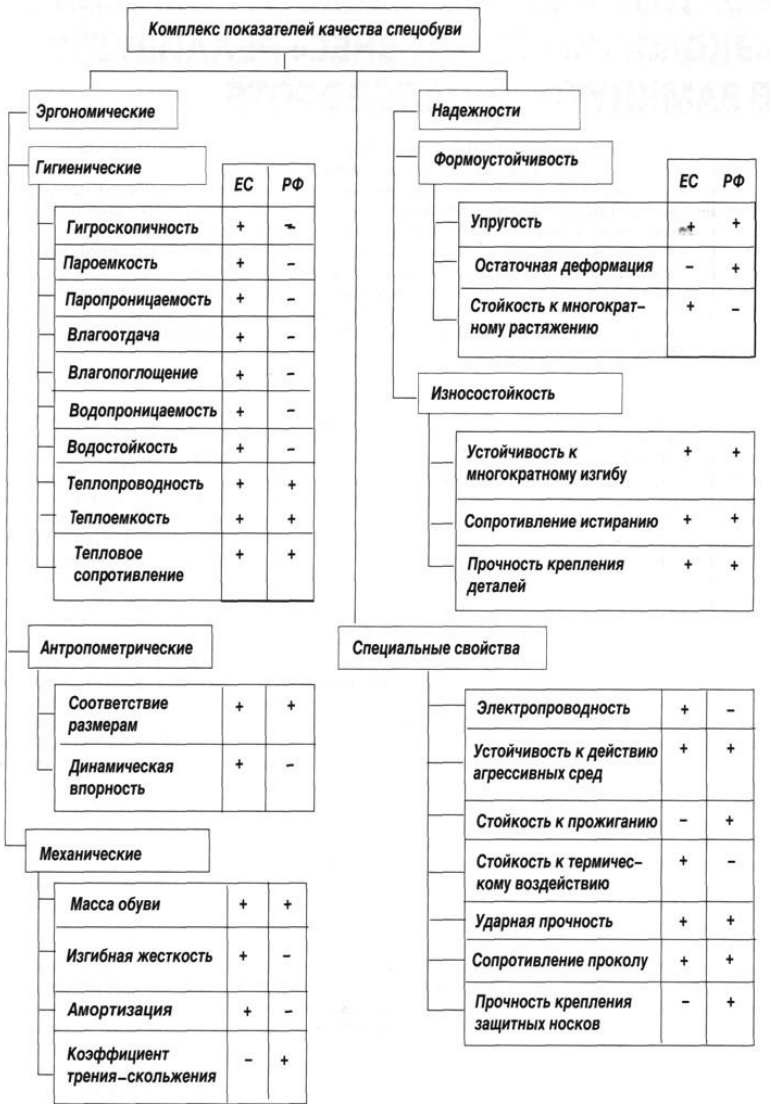

Figure 2. Quality indicators of safety footwear

The diagram (Figure 2) shows the systematized quality indicators of special footwear, where the plus sign (+) indicates indicators whose testing is provided for by the relevant ISO and RF standard, and the minus sign (-) indicates those not included in the testing procedures of the standards.

Let's consider testing methods carried out according to the ISO standard, but absent from domestic standards for safety footwear.

1. ISO 20344:2004 provides specific methods for assessing the ergonomic characteristics of safety footwear.

Three wearers, wearing properly fitted safety footwear, perform the following tests:

- walk normally for 5 minutes at a speed of approximately 6 km/h; - climb up and down 17±3 steps in 1 minute;
- kneel down, squatting.

After completing all tasks, each shoe tester fills out the questionnaire shown in Table 2.

Table 2. Questions for assessing the ergonomic characteristics of special footwear

1. Is the inside of the shoe free of roughness, sharp edges or hard areas that cause irritation or injury?	Yes	No
2. Does the toe cap or the edge of the toe cap of the shoe pinch or squeeze?	Yes	No
3. Does the shoe have any features that make it dangerous to wear?	Yes	No
4. Is it possible to fasten the fastener on safety shoes comfortably and correctly?	Yes	No
5. Can you perform the following actions without any problems: walking, climbing stairs, bending your knees, squatting?	Yes	No

Conducting this type of simple testing provides a fairly objective idea of the ergonomic performance of the footwear being tested and can serve as a barrier preventing the penetration of uncomfortable special footwear into production.

2. The ISO standard includes tests to determine the energy absorption of the heel of special footwear. This is a crucial indicator of the shock-absorbing properties of footwear. Such devices reduce impact and quasi-impact loads that occur when the heel of the shoe contacts a hard surface, such as a concrete floor. Insufficient shock absorption results in a significant reaction force that is transmitted through the human musculoskeletal system, causing negative consequences.

The testing equipment must be capable of measuring compressive forces up to 6000 N and must also have a device for recording load-deformation diagrams.

The test uses a movable stop, which is a cut-off rear part of a standard polyethylene block (Figure 3).

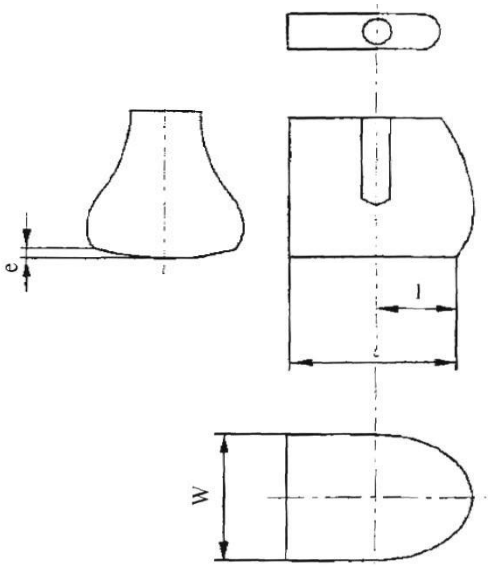

Figure 3. Energy absorption test movable stop

The dimensions of the movable stop are given in Table 4.

Table 4. Dimensions of the movable stop depending on the shoe size

Shoe numbering			Dimensions of the movable stop		
Metric	Stitchmass	± *L*2 mm	± *l*2 mm	± *W*2 mm	*e* ± 1 mm
235	Up to 36	65	32.5	52.25	2
245	37/38	67.5	33.7	57	2
255	39/40	70.5	35	58.75	2
265	41/42	72.5	36.2	60.5	3
275	43/44	75.5	37.7	62.25	3
285	45 and above	77.5	38.5	64	3

Test procedure

At the beginning, the deformation of the heel part of the bottom of the shoe s1 is established and recorded, corresponding to an applied load of 50 N. Then the recording device is turned on, which draws a load-deformation diagram, while the speed of movement of the movable stop should be set in the range of 10±3 mm/min, and the value of the applied load at the end of the test should slightly exceed 5000 N.

The area of the diagram bounded by the load graph, the abscissa (deformation) axis, and two vertical lines corresponding to displacement s1 (at a load of 50 N) and s2 (at a load of 50,000 N) represents the absorbed energy. This area is calculated using a known method, such as graphical integration or a digitizer.

The formula given in the ISO standard is not entirely correct; it would be more correct to write it as follows.

$$E = \int_{s_2}^{s_2} Fds, ()$$

Where F – applied compressive load, N;

s– deformation, mm.

The acceptability condition is written as follows: the energy obtained as a result of the experiment must be greater than or equal to the specified one, i.e. Eon E zad.

3. The domestic standard (GOST 12.4.151–85) provides for the determination of impact strength only for protective toes of special footwear.

ISO standards specify impact resistance tests for special footwear, not only for the toe area but also for other areas of the shoe that, when worn in industrial settings, are subject to forceful impacts that could cause foot injury if protection is not installed. For example, the ISO standard specifies the impact resistance of the instep protector (between the metatarsal and shank).

For this purpose, a steel striker weighing (20 ± 0.2) kg (Figure 4) is used. It falls freely along vertical guides from a specified height onto the test specimen, generating an impact energy calculated using the potential energy formula. The striker's wedge-shaped head is 60 mm long, with the edges of the wedge forming an angle of (90 ± 1), and the steel hardness is not less than HRC 60. The tip of the wedge is rounded to a radius of (3 ± 0.1) mm (Figure 3). During testing, the striker must not deviate from the vertical by more than ± 17°.

For the shoes being tested, internal wax molds are cast that replicate the shape of the last. The frame of the device must have a mass of at least 600 kg and a 400 x 400 mm metal plate with a thickness of 40 mm must be attached to it.

Wax molds are inserted into the shoe being tested and secured with fasteners. The sample is secured to the frame plate using a clamping device. A striker positioned above the sample should strike a point on the instep of the shoe at a distance from the toe specified in Table 5.

Table 5. Coordinates of the strike point

Shoe size, stitch weight	Distance, mm
36 below	90
37–38	95
39–40	100
41–42	105

43–44	11
45 and above	115

4. The ISO standard provides for the determination of the shock-absorbing capacity of an ankle protection device connected to the upper of special footwear.

This article only covers some of the testing methods in accordance with ISO 20344-2004, but even these demonstrate the attention that manufacturers must pay to the ergonomic and protective properties of safety footwear.

In today's increasingly saturated market with consumer goods, the most pressing issue is ensuring the quality of products offered meets consumer demands. Among consumer requirements for footwear, the most important are ergonomic ones, defined by the concept of "comfort."

Footwear certification testing is based on current regulatory documentation, which sets out technical requirements and testing methods for determining key quality indicators. To support this, the quality indicators and testing methods for determining them are provided below.

What is the "Russian Quality" Program? The organization's promotional materials state that it "identifies high-quality products and services available on the Russian market and informs consumers about them; enables companies to demonstrate to consumers that the quality of their products or services is significantly higher than the standard; and enables government agencies to procure high-quality products and services." The "Russian Quality" seal, which a company receives upon successful participation in the Program, becomes the most authoritative proof of such quality. Upon completion of its participation in the Program, a company can present to interested parties not only a diploma but also an assessment program and a report on its results as proof of high quality.

The results of successful participation in the Program can be used in marketing and advertising campaigns, when demonstrating capabilities to clients and customers at exhibitions and fairs, and when participating in competitive bidding and tenders. To promote products bearing the "Russian Quality" label and enterprises that have received the Program's diplomas, the following is provided:

— holding all-Russian, regional and industry presentations

— products awarded the "Russian Quality" mark;

— publication of all-Russian and industry catalogues “Russian Quality”;

— release of the Bulletin of the Russian Quality Program;

— posting information about the diplomate enterprise and its products on the Program website on preferential terms www.roskachestvo.ru and other Internet resources;

— participation on preferential terms for program diploma holders in exhibitions and fairs held with the participation of the All-Russian Quality Organization;

— publications in industry, regional and national mass media."

In accordance with the documents: “Regulations on the “Russian Quality” program” CEP VOK No. RK-01-02 and “Regulations on quality assessment programs used in the “Russian Quality” program” CEP VOK No. RK-06-02, Work Program No. RK-PR-CEP-47-02-05 was developed, which included the following points:

- products being evaluated;
- the nomenclature of the assessed product quality indicators, their acceptable and optimal values and the scores corresponding to them;
- determination of actual values of quality indicators;
- assessment of the ability of production to ensure stable product quality; - conclusion on the compliance of product quality with the highest level.

The quality of the declared models of everyday men's footwear was assessed in four groups: functional indicators (1), characterizing the durability of the product; ergonomic indicators (2); aesthetic indicators (3); indicators of the quality of packaging and labeling (4). The first group included such individual indicators as:

- strength of thread fastenings of shoe upper blanks, N/cm for one stitch;
- strength of thread fastenings of shoe upper blanks, N/cm with two lines;
- sole attachment strength, N/cm;
- residual deformation of the toe cap, mm;
- residual deformation of the back, mm;
- in the second group:
- weight of a half pair, g; flexibility of shoes, N/cm;
- Thermal resistance of the upper part of the shoe, $m^2\ ^0C/W$ (for winter shoes); Thermal resistance of the bottom of the shoe, $m^2\ ^0C/W$ (for winter shoes);
- in the third: silhouette, points; appearance, points; interior decoration, points;
- in the fourth: quality of labeling; quality of packaging, points.

The permissible values of the indicators, as well as their list, are established in accordance with GOST, indicated in Table 6.

Table 6. Quality indicators and test methods for their determination

Name of the quality indicator	Test method (GOST, standard, etc.)
1	2
1. Footwear. Method for determining the total and residual deformation of the toe cap and heel counter	GOST 9135–73
2. Footwear. Method for determining the strength of sole fastening in footwear using chemical fastening methods	GOST 9292–82
3. Footwear. Method for determining the strength of thread seams connecting upper parts	GOST 9290–76
4. Footwear. Method for determining flexibility	GOST 9718–88
5. Footwear. Method for determining the strength of fastening of the bottom parts	GOST 9134–78
6. Footwear. Method of determining weight	GOST 28735–90
7. Footwear. Method for determining the total thermal resistance of footwear	GOST 12.4.104–81
8. Shoes. Acceptance rules	GOST 9289–78
9. Footwear. Labeling, packaging, transportation and storage	GOST 7296–81 GOST 16534–71
10. Shoes. Determining grade	GOST 28371–89
11. Quality indicators system. Footwear. Nomenclature of indicators	GOST 4.12–81
12. Footwear. Terms and Definitions	GOST 23251–83
13. Footwear. Methods for determining linear dimensions	GOST 9133–78
14. Shoe lasts. Technical specifications	GOST 3927–88
15. Practical training in leather goods technology. Edited by V.L. Rayackas. Moscow, 1981.	
16. System of product development and launching into production. Light industry products. Basic provisions	GOST 15.007–88
17. Everyday footwear. Technical specifications	GOST 26167–84
18. Footwear. Durability standards	GOST 21463–87
19. Shoemaker's Handbook. Technology. Moscow: Legprombytizdat, 1989.	

Let's turn to the second group of indicators. Clearly, these indicators do not provide an assessment of the comprehensive footwear characteristic (comfort), which interests the consumer, most of which are determined empirically. Comfort depends on numerous factors, but the most significant are the design characteristics of the shoe model and the properties of the materials used. The prospect of developing shoe quality assessment methods should be linked to the use of CAD. The physical and mechanical properties of materials determine the force interaction between the foot and the shoe, provide protection from environmental influences, and determine its microclimate. In this context, the automated comfort assessment method developed at the A.N. Kosygin Russian State University, based on the physical and mechanical properties of upper material packages, appears quite attractive.

The method is implemented within the framework of a complex, the software operation diagram of which is shown in Figure 1.

Therefore, in addition to the identified groups of indicators, it seems appropriate to include another group, "Comfort," whose criteria, in our opinion, include the temperature and relative humidity of the interior space, and the pressure of the shoe upper on the foot. Factors influencing the pressure of the shoe on the foot include relative elongation, relative humidity, and the rigidity of the material packages, for which we have established variation levels and rational values based on the operating and manufacturing conditions of the products.

The developed tool system implements methods for automated shoe comfort assessment and the creation of the most efficient upper packages based on the physical and mechanical properties of materials. It also provides an express method for selecting shoe designs of a specific quality and purpose. The practical significance of the system lies in reducing the subjective factor in selection, collection, and organization.

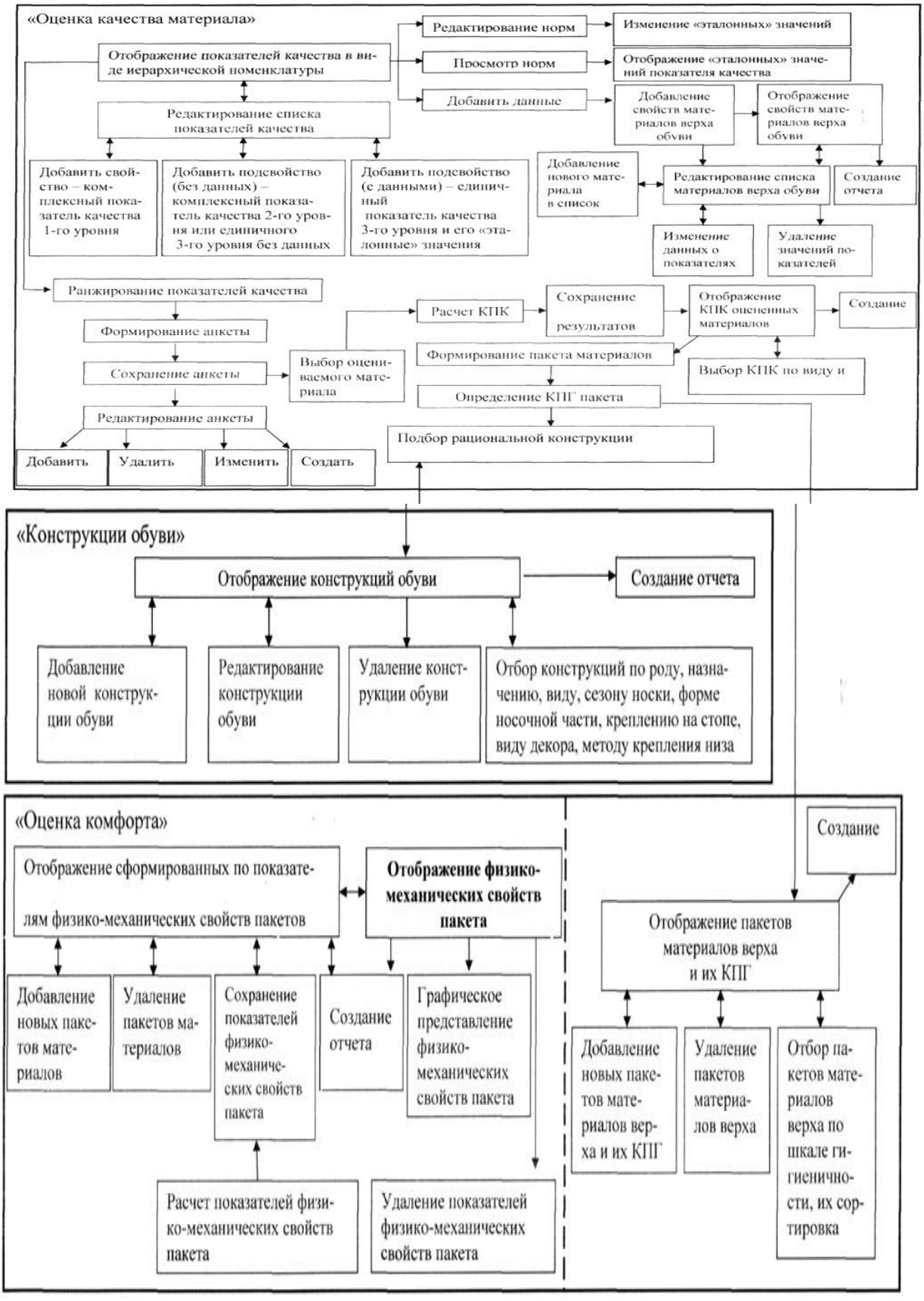

Figure 1. Scheme of operation of the software for empirical indicators for assessing the quality of products

Quality and the Market: A Marriage of Convenience - there's a separate text for this section. Marketing experts agree that consumers prioritize product quality. Market monitoring confirms a strong tradition of demand for quality goods. But not everything is so simple and obvious. The fact is that statistics is a pure operator, and statistical data are therefore absolutely dependent on the chosen conceptual description of the process. Statistical results are always correct, as they are obtained using proven mathematical apparatus, but correctness and truth are two very different things.

For something "correct" to be "true," the entire chain of logical and mathematical operations must be verified for accuracy. Certification is required not only for physical and software products. The underlying knowledge must also be certified, otherwise, flaws in the initial judgments will migrate to the inferred knowledge. And no technology will correct the inherent flaw.

In the ideology of production, especially in the production of consumer goods, the concept of "quality" must be a system-forming factor. We anticipate the objection: "What's the point of quality if quality criteria limit quantity, and the prioritization of quality characteristics will undermine product range and drive up prices?" and we have a response to these opponents.

If product quality isn't ensured, no amount of quantity will improve the situation. One will have to either accept what is (to professionals) an obvious (and even obvious) deception of the consumer, or compromise one's professional competence and deliberately lower quality standards, allowing a fundamentally inferior product onto the market. As for product assortment, its dependence on product quality requirements is relatively arbitrary and indirect. Product assortment is tied to the technical state of production, technology, and the professionalism of the developers.

The more visible the features of a civilized market, the more pressing the issue of quality becomes. Moreover, the issue of quality has moved from the realm of theoretical relevance to the level of practical relevance. Let's try to justify this shift in relation to Russian reality. The positive shift toward increased purchasing power among Russians over the past five years is undeniable. Official inflation statistics are clearly misleading, but even increasing them by a factor of 0.5 and arriving at a real average annual rate of 15-20%, we can only conclude that the well-being of the majority of our citizens has improved amidst a certain level of economic growth overall. The rate of change is small, but the fact itself is clear.

But how fair is it to talk about "well-being"? Money is merely an exchange equivalent. Earning more money doesn't necessarily make you better off. Money must be exchanged for necessary goods. And here the problem of quality comes into full play. Having earned money, you can easily spend it "unnoticed," i.e., buy not a product, but a "phantom product."

"Phantom product" is a non-specific concept within a specialized knowledge system. Nevertheless, it's important to get used to it as a theoretical expression of the realities of an underdeveloped product market.

Speculating on the "white" and "gray" "spots" of a quality ideology in an extremely neglected state, "black" producers of low-quality consumer goods, together with sympathetic officials from the services responsible for product quality, have flooded the market with substandard products.

The ISO-9000 international quality control system is more reminiscent of the latest incarnation of the famous Potemkin village. Only what is clearly defined can be effectively controlled. Anything vaguely defined is a gateway for semi-legal infiltration into the consumer hunting grounds.

ISO-9000 should be used not as a management tool, but as a tool for preventing quality violations. The circle is thus closed, because a violation presupposes quality, and we haven't properly defined quality.

In the system of specialized knowledge, which is the ideology of production, “quality” is replaced by “the state of quality”, which in turn is reduced to quantitative parameters.

Quantitative characteristics are given discrete expressions, and thus another derivative concept emerges. Only this time, not from the root concept of "quality," but from its derivative—the concept of "state of quality."

The militant drive to describe quality through quantity is astonishing. Almost two hundred years have passed since Hegel, who asserted that quality is the primary factor in defining a phenomenon, since quality is that which, when it loses its "what," ceases to be itself. It's time to embrace this simple truth: quality is defined not by quantity, but by properties. Using quantitative measurements, we must determine the "measure" of "qualitativeness" and the "state of quality" (the level of expression of quality).

Practice rarely corrects theoretical errors; on the contrary, it usually conceals them until a certain point in development. Theoretical flaws become starkly apparent in difficult socioeconomic circumstances and during times of political uncertainty.

It's no coincidence that such a unique time is "convenient" for the flourishing of theoretical uncertainty. The state, entangled in numerous problems, abandons control over economic processes, relying on the market to sort everything out. The market, however, has its own operating laws. The market adapts theory to its own interests. It doesn't obey the rules established by theory, but seeks to adapt

these rules to its own advantageous relationship with the consumer.

The advertising claim: "The customer is always right" is a lie! Only the legal order that determines the nature of relations in the commodity market is always right. These relations themselves are built on the interpretation of product quality and the correspondence between quality and price. Whatever one may say, the issue of quality and its two aspects—the theoretical and the practical—will always be addressed.

In theoretical terms, one must strictly adhere to the fundamental postulate: quality is an association of properties that characterize the structural and functional uniqueness not of a single phenomenon, but of a set of phenomena united by common laws of formation and change. Therefore, quality can only be determined through the presence of corresponding properties. Given that, of all qualitative properties, only aesthetic ones (design) are directly assessable, comprehensive product certification is required, or more precisely, the product submitted for release to the market.

Moreover, testing a product for quality that meets consumer interests shouldn't be limited to technical and materials science assessments. Social, psychological, medical, and regional studies are required. Let's consider this statement using footwear as an example. Footwear, like clothing, is a product dependent on national and historical characteristics. Can footwear be recommended for sale on the market that doesn't take into account the specifics of geography, climate, or national mentality? Apparently, such products can be allowed on the market, but only in limited quantities, for the sake of diversity and expanding consumer choice. And this isn't a matter of "kvass patriotism."

Nature, diet, and traditions influence the anthropometric characteristics of the population: the configuration and proportions of the foot, lower leg, etc. Shoes designed without taking into account national characteristics—both anatomical and physiological—will inevitably contribute to the development of foot deformities. Shoes will lose their marketable appearance more quickly, and consumers will experience constant discomfort, which (considering that, on average, in Russia, shoes are worn without regard for recommendations until they become physically obsolete) can lead to the exacerbation of chronic diseases or even the development of new ones.

China has already dumped so many shoes on the market that the entire global population (approximately 6.5 billion people) could be shod "à la Chine." Chinese manufacturers are driven by their own interests: creating jobs and ensuring sales. They offer footwear designed and manufactured without regard for the national characteristics of consumer countries. Chinese footwear today poses serious competition not only to our domestic manufacturers but also to countries that set trends in footwear fashion, such as Italy, France, the United States, the Czech Republic, and others.

For the fifth consecutive year, the Italian footwear market has seen a significant decline in production volumes. Activity in this segment of the domestic market is declining, and demand for Italian products on both domestic and foreign markets is low. Given the euro's strong exchange rate against the dollar, competition from Chinese goods is becoming even more intense on the Italian market, especially after the abolition of sales quotas on January 1, 2017. Footwear production volumes decreased by 12.9% in 2020 compared to the same period last year. In terms of price differences, product supply decreased by approximately 9.3% in absolute prices. From 2017 to 2020, Italian production fell by almost half to 281 million pairs, negatively impacting employment. Leather footwear production decreased by 8.9%, flip-flops by 23%, rubber footwear by 32%, and canvas footwear by 40%. On the contrary, Italy steadily imports around 150 million pairs of Chinese shoes every year.

The Italian manufacturer is losing ground in international markets such as the US, Germany, and France. The rise of the euro against the dollar, as well as the market shift in favor of Asian manufacturers, are negatively impacting the Italian manufacturer. According to the Italian Chamber of Commerce, more than 600 companies, including shoe manufacturers, closed in the first five months of 2020. The only market segment in which Italian shoe manufacturers maintain a leading position is the production of luxury fashion footwear for international markets.

Over the past 10 years, the number of shoe manufacturing companies in the Czech Republic has decreased from 120 to 47. But even this number may decrease due to the lifting of restrictions on shoe imports from China. While at the end of the 20th century, Czech shoe factories produced approximately 70 million pairs of shoes, last year that number was approximately 5.5 million pairs. In 2020, approximately 80 million pairs of shoes were imported to the Czech Republic, 55 million of which were from Chinese manufacturers. The average purchase price of a pair of Chinese shoes is only 54 crowns—an unrealistic price for Czech companies. "...No one buys our goods because we are unable to compete with Asian products in terms of cost, despite the fact that our shoes are much better in quality. "Unfortunately, Czech consumers prefer cheaper products, even though they know they won't last as long as our high-quality footwear," says Lubomír Chlumský, a member of the Czech Footwear Industry Association. His company has been producing and selling children's, women's, and men's footwear since 1998. As a result, Czech manufacturers are losing ground in their own market. The situation is further

complicated by the fact that, as of January 1, 2021, the European Union, in agreement with China and the World Trade Organization, lifted restrictions on imports of Chinese footwear. They can only be reinstated if the entire industry, and on a European scale, is threatened.

US Commerce Secretary Carlos Gutierrez, among the most important issues, notes the need to take effective measures to curb job losses in a number of American industries, which is also caused by growing competition from Chinese goods in the US.

But we still have a long way to go to match the progress made by Western shoe manufacturers. Russia's accession to the WTO has opened up market opportunities for many others eager to quickly offload low-quality goods. Moreover, unlike its Western neighbors, Russia already faces the fatal problem of expanding "gray" imports, which has arisen due to imperfect customs legislation and the spontaneous development of "shuttle trade." As Anatoly Kvashnin, the Presidential Plenipotentiary Envoy to the Siberian Federal District, stated in an interview, the annual volume of "gray imports of Chinese goods" into Russia reaches $6 billion. However, even in a civilized market, allowing footwear to enter the domestic market without restrictions based solely on positive assessments of the quality of raw materials, related materials, and fittings, along with significant expansion of footwear production, threatens Russia's national security.

National attitudes toward footwear can be quantified. Products can easily be measured for compliance with certain requirements, but it's important to keep in mind that the quality itself is assessed solely on a "present or absent" basis. Once a quality is recognized as existing, the expert can proceed to the next step—measuring the intensity of its existence—to determine how stable and pronounced the quality is.

The absence of even one of the product's qualitative properties, or its insufficiency, means only one thing: the product should not be considered a commodity. In exceptional cases, it is considered conditionally approved for sale on the national market.

The occupation of the national market by foreign footwear manufacturers undermines the development of the corresponding sector of the domestic economy, which has historically been adapted to the specific conditions of national development and the peculiarities of anthropometric measurements.

The situation is exacerbated by the fact that Russia, having been recognized as a market economy, has no right to disrupt the orderly relationship between political and market structures. Unilateral actions by the state in defense of its interests could be considered a violation of this status and lead to economic and other sanctions from the global market. The exclusion of foreign competitors from the national market must be carried out in accordance with the recommendations and traditions of the international community.

Chinese, Turkish, and, to some extent, Eastern European shoe manufacturers have flooded our market and established a strong presence there, thanks to consumer demand for their products.

Buyers with limited financial means are attracted by price, design, advertising, product selection, salesperson engagement, and professional service. A consumer unversed in professional "secrets" judges quality by its outward appearance and service packaging. The sales service itself skillfully shifts the focus from quality characteristics to visually appealing features. Quality, as an association of the most important product attributes, is "broken." Of all the attributes that combine to form a quality association, only the attribute that benefits the seller is highlighted, as it truly represents the appropriate level of consumer interest.

Sequestering quality by replacing it with a simplified understanding is the most common market tactic. The unsatisfactory state of mass consumer culture, the absence of oversight by government agencies, their lack of initiative, and, in some cases, their direct interest in maintaining the current state of disorder, make it possible to manipulate public consciousness and control consumer behavior.

The occupation of the Russian market is, of course, temporary, caused by economic stagnation, limited consumer demand among the majority of the population, and the lack of an effective and consistent policy for the development of national production. However, the obvious inevitability of the situation is of little comfort. In Russia, they like to joke: nothing is more permanent than something temporary. To prevent a temporary phenomenon from becoming stagnant, the conditions that gave rise to it must be changed. Opportunities exist. First of all, it is necessary to understand the theory that guides practical actions.

Underestimating theory naturally leads to practical miscalculations. In our case, such underestimation appears to be deliberate. Otherwise, how can we explain that, with the generally accepted definition of quality through the association of an object's fundamental properties, only the bare bones of a quality criterion, i.e., isolated attributes, remain in regulatory documents? To some extent, quality theory itself is "to blame" for theoretical uncertainty and one-sidedness. The quality of natural phenomena differs from the quality of artificially created products. Natural phenomena are of natural origin, and all their properties are spontaneous. The quality of natural phenomena does not include their relevance to human needs. It is pointless to divide mushrooms by quality into edible and poisonous. The quality of mushrooms lies elsewhere, and this other quality determines their place in biological taxonomy. Trees are

conventionally divided into beautiful and ugly, valuable and weedy. Such contrasts have no bearing on quality. Artificial products, on the contrary, are characterized, above all, by their compliance with our needs. Consumer properties are part of the quality system of artificial products, just like natural ones. And they don't just turn on, but they outstrip the natural ones in importance.

Shoe quality is determined by a combination of consumer characteristics. The material the shoe is made of is essentially irrelevant. What matters is that the material's properties ensure the consumer's functional demand for the shoe. Whether the shoe is made of natural or synthetic materials, given the price, is irrelevant to the buyer. What matters is that their expectations are met. However, domestic shoe (and other non-shoe) quality assessment practices invert this theory, focusing on natural characteristics. What will Russian quality ideologists do when animal rights activists take them seriously, as has happened in Western Europe, particularly the UK.

The most tragicomic thing is that the nature of the raw material is truly not such a fundamental issue if chemical and physical technologies are developed. Analogs of natural raw materials are a reality of today's production and are no longer a fantasy. But the quality issues are by no means limited to raw materials. Other aspects of production are no less relevant: taking into account national, age, and natural and climatic characteristics when determining the quality and conditions for product market entry.

Unfortunately, today, domestic input into developing policies aimed at improving footwear quality, and, in essence, ensuring consumer rights, is extremely inconclusive. One gets the impression that manufacturers' aspirations are completely disconnected from the interests of the country that gave them citizenship.

According to the theory of marginal utility and consumer choice, proven by international practice, consumers prefer the product that best suits their personal perception of utility within their financial means. The state's task is to create the necessary legislative preconditions to protect the interests of its citizens and develop a reliable control mechanism.

At the same time, the state must understand that consumers' consciousness is generally uninformed. Consumers lack the professional culture to navigate the complexities of choosing their course of action. Therefore, the state or organizations delegated protection must provide consumers with sufficient information about the consumer properties of products.

Instead, the buyer is offered, at best, a minimal set of material and technological characteristics, which is a gross violation of consumer rights. Product specifications should include, in addition to static data, detailed dynamic (behavioral) information. For example, product properties should be described in the same way as reputable pharmaceutical companies do, outlining key properties, indications, contraindications, age recommendations, functional warnings, directions for use, storage conditions, and recommended shelf life.

Experience with this approach in other industries already exists. The development of information technology today allows for the creation of entire communication systems for product support, based on the CALS concept, which is widely used to improve management efficiency and reduce communication costs in the ordering, production, supply, and operation of products. The basis for this concept is the natural need to organize a "single information space" that ensures the rapid exchange of data between producers and consumers throughout the entire product lifecycle: from marketing to disposal.

We do not yet see anything like this in the actions aimed at improving the quality of footwear products. There is not even a desire to change the information situation that developed during the times when the range and quantity of goods were limited. To confirm this, let us turn to the opinions of specialists: "During the certification of mass-produced products, experts from the certification body (CB – author's note) assess the state of production directly at the enterprise or based on the submitted documents (in absentia (!) – author's note) (technical description of a specific type of product, a diagram of the technological process, material, components with sanitary and epidemiological reports on component materials and footwear, which confirm the safety for consumer health of the primary and auxiliary materials used in footwear). In accordance with the program drawn up by the expert during footwear certification in the IL (testing laboratory – author's note), the following indicators are determined: the strength of the sole fastening; the strength of the heel fastening; the strength of the thread seams of the shoe upper blank. When certifying children's footwear, the upper construction and hygienic properties of the materials used are additionally assessed for compliance with Sanitary and Epidemiological Regulations No. 42-125-439087. "To operate at the lower end of the price range, a company must produce footwear models that are affordable due to their low price and generally only include the basic set of features in accordance with the national standard."

What conclusions can be drawn?

Firstly, the industry still relies on an outdated approach—the simplest and only necessary one: do no harm to the consumer's health. Shoe manufacturers and their regulators have firmly grasped the first commandment of Hippocrates, but they haven't gone any further. Under these circumstances, it's unlikely that the siege of competitors will be held off for long.

Secondly, basic properties should not be equated with qualities. Properties can only be qualities in the production cycle due to its differentiation into

technological operations. However, in this case, it is advisable to put "quality" in quotation marks, emphasizing the conventionality of the term. Otherwise, we will begin to operate with philosophical and scientific concepts, which will inevitably lead to a distortion of practical characteristics. Quality is an association of certain properties, so it is impossible to extract the properties that form the association based on production needs and pass them off as quality.

Third, it's high time to define basic properties conventionally, not limiting ourselves to the proposals of sanitary hygienists and epidemiologists. Much valuable information can be gleaned from the research of gerontologists, geriatricians, regional specialists, valeologists, and pediatricians;

fourthly, how long will the basic characteristics be practically devoid of aesthetic properties, even in a conspiratorial form?

The satisfaction with the de facto replacement of State Standards with national standards is also unclear. The adoption of international terminology in this component of quality ideology is of little use. If our production and ideological positions were aligned with European ones, then we could rejoice. As it is, chaos only intensifies. In the absence of corporate culture and traditions, firms left "free to roam" will resort to arbitrary action. Government agencies have acknowledged their own inability to manage market development in a civilized manner and have recalled the American fairy tale that the market will arrange and organize everything itself. The ineffectiveness of the state quality control system lies not in its status, but in its functioning. Unscrupulous and unprofessional officials prevent government agencies from functioning effectively. According to official data from the Federal Agency for Technical Regulation and Metrology, certification refusals average 2% per year. Meanwhile, over 30% of products are rejected directly at the point of sale. In the European Union, approximately 4% of the product range is subject to mandatory certification, not because European officials are liberal. The reason lies in the customs and traditions of production itself, and civilized relations in a market whose age exceeds the combined era of the Romanov dynasty and Soviet power. Haste inevitably entails costs. To move with the mainstream, it's not enough to dress and put on shoes like everyone else and fall into line. As long as the government and producers feign market relations, the mass consumer will have to pay the price, as the costs will fall on their shoulders. Exclusive buyers are protected from the vicissitudes of the Russian market by truly free choice. They purchase goods directly from reputable manufacturers. Officials are willing to do anything to be among these exclusive buyers. Companies are likely of the same opinion and are willing to pay officials for their own freedom of action. The situation can only be described as creeping state anarchy. The state has begun to degenerate prematurely.

Until recently, according to official Russian regulations, 70–80% of product lines required state quality certification. Critics reject this practice and suggest adopting Western European practices.

They aren't bothered by the fact that the share of illegal and semi-legal businesses in Russia is estimated at 40-60%. This means that even though 70-80% of products need to be centrally tested for quality, less than 40% of certified goods are already on the market. Critics defend the interests of unknown manufacturers. And who will stand up for consumer rights? Officials, or perhaps judges, who are independent only by definition. All that remains are human rights organizations, which exist today and vanish tomorrow.

The motivations for quality improvement are directly linked to economic factors. This means that quality management aims to achieve economic benefits, i.e., is focused on generating profit for the enterprise. In today's environment, the economic success of a manufacturer is ensured by producing products that meet the following requirements:

- fully meets consumer demands;
- meets safety and environmental protection requirements;
- meets current standards and specifications;
- offered to consumers at competitive prices;
- is economically advantageous for production.

Managing the competitiveness of footwear in footwear enterprises in the Southern and North Caucasus Federal Districts (SFD and NCFD) is associated with frequent changes in product range and the increasing influence of regional socio-economic factors.

Improving the competitiveness of footwear is only possible through the development of new models based on marketing information and in-depth research into the preferences of specific customer groups, accelerating product line changes while maintaining or improving the efficiency of the production system. Shoe manufacturers in the Southern and North Caucasian Federal Districts account for a significant share of domestic footwear production, more than 30%.

Despite the large share of footwear production in the Southern and North Caucasus Federal Districts, only 19.6% of demand for footwear is met; the remainder is imported from neighboring and distant countries. These imports are often smuggled. The import of cheap footwear is the most serious problem for domestic footwear manufacturers. Another problem for companies in the Southern and North Caucasus Federal Districts is the lack of high-quality raw materials and components for footwear production, resulting in footwear from southern

Russian shoe factories losing out on price to cheap imported footwear.

Furthermore, footwear companies in the Southern and North Caucasian Federal Districts specialize primarily in men's footwear. Moreover, they produce virtually identical models in identical colors. Naturally, labor costs for women's and men's footwear are disparate. Therefore, women's footwear production in the Southern and North Caucasian Federal Districts accounts for approximately 3% of the total, children's footwear production accounts for 15%, and safety footwear accounts for 40%. This low production volume of women's footwear is due to the fact that competition in the women's footwear market is much fiercer, and in this segment, shoemakers in the Southern Federal District immediately clash with Moscow-based and Chinese manufacturers, which currently hold the majority of the women's footwear market. Unfortunately, however, shoemakers fail to recognize the lack of footwear for older consumers in the women's footwear market, which Chinese shoe manufacturers do not produce, leaving a niche for manufacturers.

The situation with children's footwear production by most shoemakers in the Southern and North Caucasian Federal Districts remains more problematic. This is due to the abolition of federal budget subsidies for their production, imperfect taxation of children's footwear, and a lack of the necessary volume and style of lasts for their production. In the Southern and North Caucasian Federal Districts' children's consumer market, domestic manufacturers have been displaced by foreign suppliers who can afford to sell shoes on a payment-on-sale basis. However, these products, for the most part, lack certificates of conformity and hygiene certifications. Imported footwear is typically in the most popular, "average" sizes and is not intended for children. Therefore, children and their parents are currently forced to satisfy this need with affordable imported adult footwear. Providing children with properly fitted, physiologically appropriate footwear is a key challenge for domestic manufacturers, including those in the Southern and North Caucasian Federal Districts. The situation in the Southern and North Caucasus Federal Districts necessitates the development of a set of regional measures aimed at improving the socio-economic situation in the Southern and North Caucasus Federal Districts. Increased purchasing power for high-quality footwear in the mid-price consumer segment determines the economic feasibility of developing footwear manufacturing facilities. Establishing a wide range of footwear production will transform the currently subsidized regions of the Southern and North Caucasus Federal Districts into self-sustaining ones, raising household incomes; stimulate the creation of new jobs; ensure the development of small businesses and support for legal private entrepreneurship; and create the basis for bringing a significant portion of the real sector of the economy out of the shadow economy for the purpose of shaping the regional budget, as the implementation of a set of regional measures has economic, political, and social implications. The main stage of structural restructuring should be improving the technical level of production at footwear enterprises and the competitiveness of their products, ensuring the introduction of innovative products and high technologies, replacing certain types of imported footwear with domestically produced ones, and facilitating their entry into Russian and global markets. This requires measures to modernize and reconstruct existing footwear production facilities and create new ones, strengthen control and implement modern quality management systems, certify products and production facilities, develop a dealer and distribution network, implement an active marketing policy, and expand the use of leasing schemes for innovative activities. To revive children's footwear production in the Southern and North Caucasian Federal Districts, organizational and financial support for footwear companies is primarily required from the Russian government, as well as regional and local authorities, namely:

- in the form of a reduction in VAT;
- provision of an open-ended loan;
- urgent loan at a preferential interest rate with payment deferrals for 3 or more years;
- in the form of support for footwear companies in providing high-quality, affordable shoe materials (natural, artificial and textile).

Furthermore, companies should be allowed to use balance sheet profits to replenish working capital to provide them with high-quality and affordable footwear materials when producing children's footwear under the same conditions as for financing construction, i.e., tax-free. State procurement for children's footwear with advance payment is also possible.

Local authorities need to take a differentiated approach to establishing the structure and amounts of local taxes, i.e., reducing their amounts for children's footwear production. Particular attention should be paid to creating opportunities for large and low-income families to purchase footwear through targeted compensation, the establishment of special departments, discounted prices, credit, and installment plans.

As global experience shows, leadership in the competitive struggle is achieved by those who are most competent in product range policy, who have a perfect command of the methods of its implementation and who can manage it most effectively.

A product range development forecast should show a trajectory that will ensure the company's product offering achieves the intended alignment with

the changing market demand structure. Product range planning is a continuous process that continues throughout the product's life cycle, from the inception of the concept to its removal from the product line.

To ensure the competitiveness of footwear products from the Southern and North Caucasian Federal Districts in terms of quality and demand, it is necessary to transform the disparate light industry enterprises in these regions into a dynamic, competitive footwear cluster.

An industrial cluster is a group of geographically adjacent and integrated companies and related organizations operating in a specific industry (or multi-industry) and complementing each other. The Southern and North Caucasian Federal Districts have all the necessary conditions for creating a footwear cluster, namely:

- educational institutions have been preserved and are functioning, continuing to train highly qualified personnel not only for footwear companies, but also for related industries;
- The regions of the Southern and North Caucasian Federal Districts are characterized by the presence of a large number of unemployed people (the unemployed), the percentage of unemployed women is especially high, which requires the creation of new jobs and the reduction of social tension in these regions;
- the ability to produce a wide range of footwear not only by type, but also by fastening methods, including for children, taking into account the national characteristics of those living in these regions;
- The shoemaking traditions that developed in these regions are still alive, and even today 35% of all footwear manufactured in Russia in 2007 is produced there;
- Geographical and transport proximity to Western Europe, where footwear companies face an even more difficult choice: moving production to China, India, Taiwan, or Eastern Europe. Consequently, there are significant opportunities for investment and technological partnerships within the cluster with Western European footwear manufacturers;
- Gloria Jeans's positive development experience: 12 factories annually producing 20 million denim pieces under the Gloria Jeans and Gee Jay brands. The Russian company's leadership in the CIS market in a niche unconventional for the Russian light industry—denim clothing.
- potential for the development of a raw material base through the implementation of a program to develop cattle and pig populations;
- the presence of local manufacturers of certain types of components (soles, heels), including those that meet European standards.

The creation of a footwear cluster in the Southern Federal District will ensure:

- increasing the efficiency and productivity of enterprises, clearer coordination of work;
- increased attention to achieving business goals and meeting consumer expectations;
- achieving and maintaining conformity of the quality of the enterprise's products and services with the established requirements of consumers;
- achieving customer satisfaction that the required quality is provided and maintained;
- maintaining confidence in the capabilities of the enterprise among existing and potential consumers;
- opening up new market opportunities and maintaining existing sales markets;
- certification and registration of quality systems;
- the ability to compete in this field with larger enterprises (i.e. the ability to offer reasonable prices or maintain them).

Existing and newly established enterprises and firms in southern Russia, using the proposed measures, will be able to produce competitive footwear in sufficient quantities to meet the demand of various population groups with specific income levels and social security. The history of quality issues can be divided into two periods. During the first, serious interest in quality was largely limited to professional theory. Philosophers attempted to define quality and its systemic position; however, even in numerous philosophical debates, the concept of "quality" was not among the key issues.

The actualization of the theory of quality turned out to be dependent on the degree of development of the system-forming philosophical concept of "being" in the context of the basic concepts derived from it, i.e. those concepts that help to realize the ascent from the extremely abstract assertion of existence with the only distinguishing property of being, to exist, to a concrete understanding with an established content, thanks to the answers to derivative questions such as "What is everything made of?", "Due to what does everything exist?", "Is there non-being?", "In what systemic forms does being acquire its definition?"

Apparently, it was precisely the last of the listed questions that led philosophy onto the "path" of that interpretation of quality that "hooked" not only those who "established" a fundamentally new type of worldview in human history.

It's logical to assume that the problem of the substance of being, as the first step toward a theory of quality, was unlikely to interest anyone outside the limited community of philosophers. All indications are that it was of interest to those whose gaze was directed toward the Cosmos, into the depths of its structure, while the overwhelming majority of fellow philosophers were preoccupied with earthly problems.

For the masses, variety and choice in goods were essentially unavailable. The plebeians demanded "Bread and circuses!" The feast of life in all its diversity was enjoyed by a small aristocracy. The issue of quality of life was addressed in accordance with the sociocultural architecture of society. This problem undoubtedly existed, but it failed to mature into a pressing issue for society. The reason is simple: there was a lack of sufficient mass demand for a quality product.

The issue of quality has acquired significant social relevance in the context of the transition to a mass production economy, the democratization of social relations, the development of education, the accessibility of education, and other cultural values. For the issue of quality to become one of the most important for society, it had to be relevant to the majority of those who make up that society. Without the right to freedom and the purchasing power to make choices, "quality" cannot be a priority in the mass consciousness. Elite demands for quality, however, are developed in exclusive, unconventional theories whose primary goal is not the attainment of truth, but the satisfaction of customer needs.

Of course, the qualitative and quantitative characteristics of natural and artificial phenomena were known long before these attributes became relevant in social existence and the consciousness that reflected its development. However, in light of our research, the existence of de facto knowledge of quality is less significant. The subject of our research is not the awareness of quality, but the development of an understanding of quality across different horizons of social history.

Development is a universal state of all existence, from the simplest material substrates to the highest forms of thought. Both quality and quantitative expression were improved, and the relationship between qualitative and quantitative changes became clearer. The emphasis shifted from quantity to quality. Having proven its evolutionary resilience, humanity shifted to the principle of "skill, not numbers." The struggle for survival gave way to a desire for a high standard of living, broadly defined. The struggle for a dignified quality of life began.

As history shows, having abandoned savagery and barbarism and laid the foundations of civilization, humans have noticeably changed in their outward forms of manifestation, but civilization penetrates the depths of human nature slowly and arduously. Biological history has imbued human nature with an active principle, combined with a developed capacity for thought, significantly superior to all other forms of reflection. But this entire superstructure formed over a rather rigid animal framework, subordinated to the systemic goal of survival in struggle. The conditions of struggle have transformed, introducing adjustments to the means and forms, but the natural foundation itself has proven highly inert.

The transition from natural, biologically based egoism to rationally active egoism, despite the well-known civilizational means of cultivating it, did not meet the predictions of either romantics or realist optimists. Civilization was marked by non-civilizational forms of relationships in its movement toward a quality life, which further heightened interest in quality. To rank among the most important issues, quality had to be presented in several functions: as an end, as a means, and as a condition for the development of all social actors at all levels of life.

For historians, history is events and participants arranged in a temporal sequence, a kind of chronology of significant facts in social and, to some extent, personal life. Philosophers and non-historian specialists see their own interests in history. Philosophical and specialized interest in history is driven by the need to understand the dialectic of process as it applies to human activity. The specialist seeks to discover trends in the past that provide solutions to their problems, often far from specific.

Intuitively, even at the dawn of civilization, the term history (historia) was interpreted as the study of a given process, as opposed to a chronological description. The Ionians called narrative, the account of the past, logos. Only later, in the works of the founders of philosophy, did logos acquire its modern meaning—thought, idea. Both Herodotus and Thucydides understood history as an understanding of the course of past events, necessary for "instructions in the way of life" for those living in the present. Having stood the test of time, historicism strengthened its position, becoming the ideological foundation of cultural memory. N.A. Berdyaev asserted: "From the first days of Creation...man is in the historical, and the historical is in man. To delve into the depths of time is to delve within oneself."

The past dissolves into time, leaving us, along with memories of the past, thoughts of the present and responsibility for the future. The new is always relative. Goethe was right when he said that everything intelligent is already known; we just need to think it through again.

History is a treasure trove of ideas, a gold mine for a thinking person, no matter what their occupation. Different attitudes toward history are the combined effect of two factors: the first is the interpretation of time, the second is the self-perception of time. In the pre-Christian period of history, time was understood cyclically, as the sum of repeating, self-contained cycles. With Christianity, this view of time changed. Time was seen as an ascent to the infinite, divided into a finite, earthly, and an infinite, extraterrestrial. The opposition between cyclical and non-cyclical views of time is characteristic of theological theory. It is of no interest to us, however, nor are the properties of time in their abstract form.

Since Hegel and Marx, it's not the concept of something in general that's relevant, but rather an

immersion in the concrete, objective, or concrete, historical state of whatever becomes the object of study. In the case of time, it's not so much its universal properties that matter, nor its direction and direction. What's important is that everything that exists in time can only exist by conforming to these objective characteristics of time. To exist in time means to possess the properties of time. This proposition applies universally to both the infinite diversity of individual phenomena and the essential attributes of being inherent in them, which include "quality" and "quantity."

The standard understanding of the law of the transition of quantitative changes into qualitative ones simplifies the view of their connection. Both Hegel and Engels were far removed from the meaning propagated under the guise of dialectical development theory. Quantity does not directly transform into quality. A new quality, a qualitative state, arises as a transition from a previous quality. Under changed quantitative conditions, measure exhausts its reserve of functional stability.

Measure is a "qualitative quantity"; it indicates the limits of change in quantity without significant consequences for the given quality of the phenomenon. When quantitative indicators necessary for the achieved quality exceed the limits of measure, qualitative transformations inevitably occur. Simultaneously with the loss of the previous quality, a new quality is born from it, based on it, commensurate with the changed quantity. Measure occupies a key position in the relationship between quality and quantity. Quality specialists, however, prefer not to seriously discuss measure, reducing it to quantitative standards. As if measure were some kind of passing state of the "quality-quantity" system. It is necessary to clearly understand the objective and functional role of measure in the management of both quality and quantity.

"Measure" pertains neither to quality nor quantity. It expresses the systemic relationship between quality and quantity, linking them. So, first: quantity and quality interact through measure, and measure mediates their connection. What "benefit" will a practitioner derive from this conclusion? Mass production, including its "thrifty" variety, requires a dimensional characteristic; otherwise, the fairy tale of the pot of porridge or the "seven-flowered flower" has a good chance of being realized. Chinese consumer goods are a classic example of the destruction of dialectical unity in the "quantity-quality" system.

The market, by its very nature, is incapable of controlling the measure that regulates relations in the "quantity-quality" system. With the emergence of wholesale forms of development, the ascendancy of financial capital, and its natural offspring—large-scale speculation and intermediation—the modern market has pitted itself against production and lost interest in the state of production. The market, exploiting the specifics of mass production, has become saturated to the extent of its perversion and can afford to dictate the qualitative characteristics of goods.

The state behaves in the market like a kindergarten teacher. It places the interests of the market above those of producers and the mass consumer. Under the umbrella of the general idea that the market drives production, the market and the state are merging. Quality and quantitative assessments are relegated to the realm of subjective arbitrariness.

Until a theory of quality is systematically developed, quality management theory will be based on empirical principles, which are incapable of encompassing the subject matter as a whole and are relatively meaningful within the limited context of production. For lack of anything better, they are used to extrapolate local experience to other conditions, achieving results through additional adaptation measures, which, unfortunately, are again temporary and partial.

A certain logic can be discerned in the kaleidoscope of changing quality management methods. Life, however, demands not a "definite" logic, but logical certainty in the form of a holistic, systemically grounded theory of quality as a methodological foundation for constructing universal principles of quality management theory. The starting point here should be the idea of the systematic nature of the "quality-quantity" relationship within the framework of their coexistence.

Quantity helps quality to fully blossom. A high-quality piece can be created in a single copy, but to fully realize the manufacturer's potential for quality, a single piece (or work) is clearly not enough. The Fabergé house secured its fame with its first branded piece, but it became a brand through subsequent successes in creating its collection.

An example of a systematic understanding of quality within the framework of measure—dimensional certainty—is small series, such as the production of collectible coins and medals. Quality is fixed within the boundaries of a quantitative value, which serves as a measure of its expression. This is not only about providing preferential conditions for the product's VIP consumer. The dependence of objective quality indicators on the quantity produced is also significant. Mass production is objectively associated with a decrease in product quality. Measure is the boundary service of quality; going beyond the measured quantity is a crime against quality.

A mass domestic manufacturer is unlikely to be interested in quality theory. It's irrelevant to them. If anyone were to stumble upon our reasoning, they'd likely smile at our naivety. Trying to restructure the Russian market with theory, to give it a civilized appearance, is classic quixoticism. First, we need to organize the market space through political will, legislative initiatives, and effective, not sham,

oversight of the legal order, bringing back the manufacturer, eliminating the countless middlemen and speculators.

A true producer isn't interested in speculative operations. For sustainable development, it requires its own consumer, who, incidentally, is not at all opposed to having a defined and accessible producer within the framework of moral and legal relations.

A sense of national pride is nurtured by history and the existing reality. You can study at school using the best history textbook, but beyond history lessons, there's current life, which is more impressive than historical excursions. In the East, they say, "No matter how many times you repeat halva, it won't taste sweet." Theory has always been considered the best practical guide, albeit under normalized circumstances. By going illegal or semi-legal, a manufacturer alienates itself from quality and, naturally, from the theory of quality. This then leads to the substitution of pseudo-quality, and the costs of advertising hype rise.

Quality does indeed entail significant costs, but it guarantees a stable market position. By focusing on quality, manufacturers build confidence in their own and the nation's future. A well-developed understanding of quality guarantees future prospects even in the context of a domestic semi-market.

Let us try to formulate practically significant fundamental principles as an introduction to the theory of quality:

- Quality isn't simply the sum of the properties essential to a product's existence; it's a unique combination of them, typically built on two attributes—one more general and one more specific. For example, shoes are "clothing for the feet," a hat is "clothing for the head," a scarf is "clothing for the nose and neck," and so on. Consequently, they deserve the most attention.

- Quality allows for changes that do not lead to a loss of quality but that reduce or increase its consumer value; quality is a set of qualitative states that satisfy, to varying degrees, system-forming characteristics. Quality "play" allows for flexibility in the process of creating a product with a given quality, depending on the specific capabilities of the manufacturer and consumer.

- Quality does not exist without quantity; they are dialectical opposites, their opposition valid only within the boundaries of unity. It follows that, when creating quality, it is necessary to incorporate quantitative expression into qualitative characteristics, both in relation to individual product properties and the quantity of goods produced. A.K. Savrasov, finding himself in a difficult life situation, made several copies of his famous painting "The Rooks Have Come Back." As a rule, artist-made copies are of a high level of craftsmanship and command high prices. The artist was also paid. When P. Tretyakov was asked whether he would buy Savrasov's copy if something happened to the original, his answer was predictably categorical – no! Quality requires not only craftsmanship but also inspiration. Inspiration fades with repetition. Quality is always quantitative, and quantity is qualitative.

- Quality and quantity are linked by a measure that is often overlooked. However, when defining quality, one must simultaneously consider its dimensionality, both from the perspective of market conditions and from the perspective of the quality attributes themselves. "Quality" is concretized in the concept of "quality." "Quality" is a concept that reflects the model image of a product, while "quality" defines the quantitative limits of the reality and reasonableness of quality (the physical and moral status of a product).

- Quality and the concept of quality are stable phenomena, but time changes them. Initially, quality was equated with meaning. The criteria for quality were the usefulness and magnitude of an object or relationship. With the development of consciousness and practical capabilities, the foundations for comparison and choice emerged. Quality becomes relatively distinct from quantity. Utility is differentiated, and participation is reconsidered as quantitative attributes. The evolution of the understanding of quality is directly driven by the embodiment of creative potential in activity. The discrepancy in the intensity of the advancement of individual skill, the interests of those called upon to clear the path of talent, and mass consciousness complicates the understanding of quality and the process of quality management. The concrete interpretation of quality, particularly its fundamental attribute of objectivity, acquires particular significance. The social theory of existence is built on a natural-historical foundation—its canvas was laid by nature, and its historical pattern was created by man. In the natural environment, all attributes, including such synthetic ones as quality, are products of spontaneous movement. In society, every phenomenon is subject to activity, incorporating both human mental and physical labor into its quality. Determining the quality of phenomena created by human activity is impossible without sociocultural specification. Therefore, two questions arise:

- In what status and to what extent does consciousness enter into what is traditionally called the quality of things (with services there is more clarity)?

The answers to both questions must be sought in the philosophical theory of alienation. Alienation theory has no direct relation to quality theory. It holds the keys to the methodology for constructing a theory of quality.

From the above discussion, it's clear that the authors aren't idealists; rather, they balance on the edge of pessimism and optimism. They are critical of the modern, pragmatic approach of market liberals to

scientifically and philosophically grounded theory. A watered-down version of theory, in which a fragment torn from a general theory is transformed into the theory itself and tailored to the structure of a market distorted to suit speculators, suits the needs of economic theorists and suppliers of high-quality surrogates to domestic stores. How long the Russian economy will maintain this configuration is unknown to us (and not only to us), but global experience of economic development at various stages of economic relations shows that transition periods pass, and over time, economic life returns to normal.

The trajectory of the process of alienating human creativity to what exists outside of itself must necessarily preserve and activate the capacity for creativity. Unlike the existence of nature, human existence is not substantial. It is not self-sufficient and can only exist through mutual exchange, initially with nature, and subsequently with society, through which human relationships and interactions with nature are built. The instrument that ensures human existence is labor, and the highest quality of labor is manifested in activity.

The quality of activity, on the one hand, is an indicator of the quality of a person's life (as it should be!); on the other, quality activity is integrated into the quality of what they transform. The quality of "first" (natural) nature is formed spontaneously, as a set of objectively interconnected natural attributes. The quality of "second" nature (reconstructed, adapted by humans to their own interests) is synthetic. It is represented by a double helix formed by the natural attributes of natural material (possibly in human relationships, indirectly expressed knowledge) and the qualitative characteristics of human activity—knowledge, emotions, will, value orientation, and skill. Ultimately, the quality of a product, as distinct from the product itself, embodies the quality of the individual.

The individual is alienated in quality, and therefore, in principle, alienation is natural and does not oppress the individual. The negative consequence of alienation is caused by the disproportionate compensation for lost activity energy. Upon discovering a poor-quality product, a hidden manufacturing defect, or a seller's deceptive actions, a normal buyer becomes upset, primarily because of their own poor decision. Other losses in the transaction are usually compensated. A sense of imperfection in one's own taste and knowledge remains.

The quality of everything created by activity encompasses the properties of activity, both practical and spiritual, in an objectified (objective or functional) form. This leads to the conclusion that it is necessary to shape and guide the development of the mass consciousness's capacity for qualitative evaluation of goods: certain experiences were established during the Soviet era and demonstrated their effectiveness: "circles," "schools," and "universities," including those initiated by television and radio. The place for systematic education of the mass consumer, professional assistance in developing a culture of qualitative selectivity, is today overwhelmed by aggressive advertising, the quality of which is uncontrolled or disproportionate to the scale of deception. Who should be the primary educator? The manufacturer, and only the manufacturer, for only they, according to the logic of developing understanding, should fully understand what quality is. Undertaking the production of a product without understanding the specific quality of a given item means professional failure in the marketplace. Releasing a product with sham quality is punishable by law, albeit formally and post-factum. This is precisely what suppliers of pseudo-quality goods hope for.

To be fair, let's say: true creators of quality products will remain pariahs in our market as long as law enforcement officials are confident of impunity for corrupt practices. Nevertheless, we must move forward. History, albeit ugly, is moving toward order.

WTO accession hasn't increased our supply of quality products, nor has it lowered their prices. The real prospect lies in the creation of a unified economic space within the Customs Union. This will create cross-checking of quality, weakening the influence of corrupt national forces on the market. As for the potential for increased interethnic criminal activity, the danger exists, but the different organizational conditions and intercriminal competition should slow the degradation of the market—the main obstacle to the development of high-quality national goods. The market itself, whatever its nature, will expand, and access procedures will be simplified.

Let's be honest: the problem of quality remains theoretically one-sided, which is hardly noticeable because there is no proper organization for the production and marketing of high-quality products. Current practice is satisfied with this degree of certainty in quality theory. Quality management theory has been simplified to the concept of monitoring the conditions of high-quality production. Meanwhile, there is no systematic understanding of what constitutes product quality. Production is driven by the market. Speculators and intermediaries rule the market. The state strives to minimize its economic function before collecting taxes. There is no real effort to impart a civilized form of "buying and selling" to the market based on the principles of genuine freedom of competition. Oversight of essential quality indicators is limited to the point of being practically useless. The market dictates order to local and regional governments. A store director once ran the defense department. The culture of the producer and consumer is of little interest to anyone, and they are of no concern. Yet external order begins with internal

order, with an awareness of the "political moment" conditioned by the economic situation.

Historically, the understanding of quality and the concreteness of its reality represented in a product reflect the economic and cultural development of society. During the era of guild production, quality was determined by the conservatism of manufacturing techniques, but even then, municipal authorities strictly monitored the quality of products, as well as the capabilities of potential producers; official regulations, approved by city or national authorities, were in effect. Agricultural products were controlled by consumers themselves.

The Industrial Revolution simplified the production process and created the conditions for mass production. Adequate quality control measures were required. As the social architecture became more equal and a wider range of goods became more accessible, notions of quality shifted toward its qualitative component. At the same time, the possibility of falsifying quality arose. From there, both de facto and de jure, it was only a step to substituting brand qualities. Going beyond the limits of measure opens the door to legal violations and moral crisis, even to the point of lawlessness.

Were the trends in the interpretation of quality and attitudes toward quality that emerged in the economy of mass production inevitable? No, they were generated by the new nature of production, reflected this nature, and to a certain extent constituted an objective reflection. However, beyond the object reflected by consciousness, there is a perspective of reflection determined by the reflecting subject's position of consciousness, their interests as a participant in processes occurring in objective reality.

Objective reality itself, by definition, is located outside and independent of consciousness. Its reflection is subjectivized, which, in general, seems consistent with reflection theory. However, it also allows, in particular, for subjective distortion—involuntary, due to misunderstanding, and conscious, for the purpose of gaining a temporary advantage. Competition is always a struggle, but unfortunately, the struggle is not always conducted according to the rules.

Quality has been and remains a subject of manipulation in the interests of those who control the market. Consensus on quality among creator, manufacturer, seller, and consumer is the sweetest fairy tale. Agreement is achieved between creator, consumer, and producer. This "trinity" embodies the subjective mechanism for resolving the problem of alienation. The creator—the product's creator—finds satisfaction in production and consumption. They realize their human potential in them. The producer is interested in a stable relationship with the creator and consumer. The consumer is satisfied with quality and a reasonable price. "Promotions" and "sales" do not confuse or deceive them.

The seller stands in the way of consensus. He is the party in the relationship that, essentially, has nothing to do with the quality of the product, yet he is the key figure in the market economy. We buy everything we need from him. He is a monopolist and, as such, dictates the terms of the relationship through price and profit margins. In Novosibirsk, not a single brand-name light industry enterprise has emerged in the past twenty years; on the contrary, a host of brand-name retailers have emerged. Retail aisles are proliferating, yet consumers are being assured that their production is unprofitable. Retail culture is being replaced by the concept of "sales quality." Retail culture is measured by product selection, price and availability, high-quality consulting support, the absence of queues, compliance with sanitary and hygienic standards, the appearance and behavior of staff, and customer service. "Retail quality" is determined by the proportionality of price and product quality, the conformity of the product to its certification, and the demonstration of the product. The seller's profit should not exceed the manufacturer's profit. Both need to avoid waiting for increased purchasing activity solely due to rising consumer wages, but rather create a most favorable environment for the buyer (without colluding with another market predator – banks).

Only in Russia, and only liberal marketeers, take every opportunity to recall how poorly people lived before the advent of genuine democracy—starving, living in rags, living in unknown places and ways. Monitoring quality of life—through quality consumption opportunities—is appropriate within the current era. There's only one criterion: is the consumer basket growing, and how is it growing?

Inflation is a necessary, but not sufficient, indicator of quality of life. The government has set inflation reduction as its primary goal. This indicator is indeed socially and economically significant, demonstrating market culture and, indirectly, the state of production. The downside of this indicator is its lack of quality. Quality of life is determined by the quantity of products consumed in monetary terms. Qualitative composition remains constant, and quality can only be speculated upon, as quality blurs quality. The quality of shoes, clothing, cereals, fish, vegetables, and fruits within a common name varies significantly. There is considerable scope for quality manipulation. The key to understanding quality is not the name, but the systemic characteristics of the product, reflecting the assortment, its changes, and the dynamics of the proportional representation of the constituent goods.

Quality represents a system of essential properties for a product—this is trivial and well-known, yet it is actively exploited. This is done by substituting properties or their systematic nature in a quality product. Essential properties are those that are not simply inherent to a product; they determine its

functionality. Such properties are typically revealed during the product's intended operation; they are hidden from the untrained eye of the consumer. In its pure form, the market is an intermediary and should have no interest in product quality. The purpose of the market in the theory of commodity production organization is to organize exchange between producer and consumer. Market development stimulates increased production in the interests of the consumer within the limits of the market's infrastructural status.

The monopolization of production has led to the accumulation of financial capital, its autonomy, and market control. As a result, the market has transformed from an intermediary into a key actor, attempting to replace its indicator function—demonstrating the demand for goods—with the role of organizer of economic activity as a whole, which distorts the economic system.

The commodity economy was created by the production of goods and the demand for mass production. The system-forming factor here is the production of goods as a product necessary for consumption by others, that is, the process of alienation of consumption. Under natural production, product quality was hardly a pressing issue. Quality was "dissolved" in the conservatism of technology and technology, and the traditional nature of product ranges. The consumer raised the issue of quality when he gained the opportunity to compare products at fairs. The market, which grew out of fair gatherings, gradually enriched its representative status with advertising, taking control of producer-consumer relations. The levers of control are financial policy, and the main directions are two: influencing quantity and quality.

Product quality became relevant in commodity production. It became clear that the understanding of quality involved both sensory and rational thinking (the latter in the form of calculation). The subjective factor was objectified and fetishized. The market was unable to directly influence the objective properties of a product (through its own mechanisms), but it could very well objectify subjective perceptions. Thus, quality manipulation was first included in the functions of the market, then became an element of economic policy.

A sound and healthy economic policy is called upon to improve quality in two interconnected areas: technical and technological, supported by a strict legal framework, and sociocultural – providing comprehensive support for the development of conditions for the subjective perception of quality and countering the negative impact of advertising, which has long been a hallmark of market speculation on the importance of quality to consumers. The availability of choice and affordability do not guarantee a quality purchase.

In the current market, price and quality are divorced even at auctions renowned for their meticulous organizational culture. Buyers are transformed into experts, and this marketplace sham isn't so much bad as it is illogical. The market forces consumers to develop as individuals. To avoid being dupes, we, instead of being mere ordinary people with a wallet, involuntarily strive to learn more about the subject of our interest, raising our "buyer skills." The term isn't new; journalists use it, but for them it's a throwaway line, a verbal gimmick. For us, however, it's no longer a new combination of commonplace words, but a crucial concept, without which modern quality theory lacks a systemic, holistic form.

"Buyer qualifications" include, along with certain knowledge needed to locate a store, the price range of a product, and require basic information about the manufacturer, the product's quality attributes, the manufacturer's market reputation, the company's traditions, and the scale of its operations. In today's consumer market, a naive buyer risks becoming a victim not only of deception but also of their own carelessness, and therefore without any right to compensation.

Consumers in Russia are protected only formally. In reality, they must adhere to the famous maxim: "A drowning man (or "buyer") must save himself (read: "buyer")." Improving "buyer qualifications," if desired, is a mutually beneficial endeavor for the state, activating the national cultural heritage and patriotic sentiment of the mass consumer. However, there is another approach, tried and tested under Mao in China: "the worse, the better."

Imported consumer goods – not Chinese ones – were a big hit with us in the 1980s and 1990s!

The product range, packaging, and appearance were impressive. And the result? Ten years later, the manufacturer is bringing back Soviet brands, naturally without effective oversight, and not of Soviet quality.

Conclusion

We know how to make high-quality products and are fully capable of reclaiming "our" market. The issue isn't even price; the problem is the loss of control over the consumer market (and not only consumer market, judging by the failures in rocket technology, aircraft operation, etc.). They tell us: economic measures are needed. True, but that's a half-truth. If they are needed, then adopt them. The government should have more than just nominal power. It's time to understand that economics has always been politics, and economic theory, political economy.

Economic movement is self-movement, but it does not occur in a vacuum. The economy is the foundation of social movement. Society provides the conditions for economic movement, and the state has the right to vigorously engage in the mechanisms of economic self-movement, guiding economic development in the interests of society.

It's astonishing. When it comes to the future of technological progress, futurologists of all stripes lament that the autonomous movement of technology will lead to robots dominating humans, and that it's better not to interfere with economic development. For whom is this better? The obvious conclusion is: not disrupting the economy's self-propelled movement is in the interests of those who privatized the economy and who employ "border guards" who forbid political control of economic processes.

None of the convertible currencies are backed by a high-quality commodity equivalent, and the "free" movement of currency continues under the guise of politics. Financial self-regulation creates favorable conditions for chaos in the consumer market. The state weakly protects the legitimate interests of domestic producers, even when the goods are the product of international integration. There is no political aggressiveness; politics drags along behind the economy instead of anticipating its development based on objective socioeconomic trends. One is tempted to believe politicians' explanations regarding the timeframe for WTO accession. It's good that they negotiated, creating a legal "safety net" for domestic producers of consumer goods. The problem is: how will they take advantage of the concessions from the WTO?

The time for political action—not decisions—is most favorable. The haze of the 1990s and 2000s seems to be waning. Awareness of the qualitative advantages of many Soviet light industry and food products is returning. There is a revival in such operations, which could stimulate agricultural production in rural areas. Mistrust of consumer imports is growing, in part because of their mass production in China. Migration flows are stabilizing.

The harsh assessment of the socioeconomic situation and the direct reference to government responsibility for failing to implement the 2016 presidential instructions in Vladimir Putin's Address are associated with a determination to "tighten the screws" to ensure progress remains on track. The clear intensification of interethnic economic relations within the Customs Union and the reset of strategic relations with a focus on China, India, Iran, and Latin America are also evident. The real opportunity for full-scale cooperation with Egypt, Syria, and Iran—key states in the Middle East and northern Africa—all of this represents a unique international opportunity to restore balance in the domestic consumer goods market.

References:

1. Porter, M. (2025). *Competition* / - Moscow: Publishing house. Williams house, 2025 - 608 p.
2. Glushakova, T. (n.d.). *Measurements of consumer satisfaction and enterprise management* / - Retrieved from http:\\www.quality.eup.ru
3. Efimov, V. (2025). *Types of consumer value of products* / Moscow: Standards and quality - 2025 - No. 5.
4. Karsavin, L. P. (2025). *Philosophy of History* / - St. Petersburg: AO Komplekt.
5. Knorring V. I. (2024). *Theory, practice and art of management* / -- Moscow: NORMA-INFRA.
6. Salimova, T. A. (2024). *Diversification of quality management* / - Saransk: Publishing house of the Mordov. University.
7. Shadrin, A. D. (2025). *Five needs, eight principles, ten commandments* / Moscow: Standards and quality, 2025 - No. 2.
8. Rebrin, Yu.I. (2024). *Quality management* / -- Taganrog: Publishing house of TRTU, 2024, 174 p.
9. (2025). *Efficiency and Quality Management.* Modular program/in 2 parts - part 1. Moscow: Delo, 2025 - 800 p.
10. Feigenbaum, A. (2025). *Product quality control* / -- Moscow: Economica, 2025, - 471 p.
11. Salimova, T.A. (2025). *History of quality management*/ -- Moscow: Knorus, 2025, 256 p.
12. Ponomarev, S.V. (2024). *Product Quality Management. Introduction to Quality Management Systems* / - Moscow: RIA "Standards and Quality", 2024, 332 p.
13. Imai, M.G.K. (2025). *The Path to Cost Reduction and Quality Improvement*. / - Moscow: Alpina-Business-Books, 2025 - 346 p.
14. (2024). *"What is Six Sigma? A Revolutionary Method of Quality Management"* / Moscow, Alpina-Business-Books, 2024, 158 pages.
15. Womack, J. P. (2025). *Lean Manufacturing: How to Eliminate Waste and Make Your Company Prosper* / - 2nd ed, Moscow: Alpina - Business - Books, 2025, 473 p.
16. Michael, G.L. (2025). *Lean Six Sigma: Combining the Quality of Six Sigma with the Speed of Lean Manufacturing* / Moscow: Alpina - Business - Books, 2025, 360 p.
17. Singo, S. (2024). *Fast changeover: a revolutionary technology for production*

optimization / - Moscow: "Alpina - Business - Books", 2024, 344 p.

18. Vader, M. (2025). *Lean Manufacturing Tools: A Mini-Guide to Implementing Lean Manufacturing Methodologies* / Moscow: Alpina - Business - Books, 2025, 125 p.

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Issue Article

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ON THE NEED FOR ENTREPRENEURIAL ACTIVENESS IN THE ASPECT OF DECISION PROBLEMS OF CREATING CONDITIONS FOR THE INTEGRATED USE OF RAW MATERIALS IN THE REGIONS OF THE RUSSIAN ARCTIC

Abstract: *In this article, the authors examine the systemic and emerging challenges, risks, and opportunities for economic development, including sustainable development, in the Russian Arctic. An analysis of the characteristics, trends, and prospects for industrial production in the Russian Arctic is provided, revealing the challenges and specific features of single-industry towns. The authors also establish the readiness of Russian Arctic regions to overcome current economic instability from a labor market perspective. The authors examine the challenges and substantiate the prospects for creating conditions for the integrated use of raw materials in Arctic regions. The authors also identify the conditions and prospects for shift work transformation as a reserve for changing migration trends and developing the Arctic labor market.*

Key words: *current issues, investment projects, global recessions, geopolitical processes, problems of increased costs, socio-economic processes, Arctic zones, economy of the Arctic Zone of the Russian Federation regions.*

Language: *English*

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Introduction

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To establish such aspects and justify the tasks, the following facts are relevant, which we relied on in our research and the results of which are reflected in this article, namely:

First, the results of a review of the global and national impacts on the development prospects of the Arctic Zone of the Russian Federation regions confirmed the potential for economic and associated socioeconomic growth for the Arctic Zone of the Russian Federation regions, the development of industrial production, and the mitigation of risks to increasing the primary exports of the extractive regions. It should be noted that the current consequences of the implementation of the SVO in Ukraine have increased the risks of realizing these promising opportunities, but the "pivot to the East" and the implementation of a full-scale national economic policy by Russia support the preservation of the established potential.

secondly, the established preservation of the strategic goals for the development of the Arctic, the implementation of which is ensured by the accelerated implementation of a mechanism for increasing investment activity in the Arctic Zone of the Russian Federation;

Thirdly, an understanding of the nature of public and corporate governance policies and practices during the COVID-19 pandemic in the Russian Arctic regions revealed the primacy of environmental issues, social responsibility, and the associated climate change issues. This is fully consistent with the latest global trends in accelerating the implementation by enterprises of strategies to ensure sustainable development factors in the regions where they operate, including greening production, adhering to ethical standards, promoting regional economic growth, and corporate social responsibility.

These facts confirm the significance of our chosen broad context for studying the development of the Russian Arctic, not only from the perspective of achieving the economic performance of specific enterprises and the Arctic development targets established at the regional and national levels, but also in the context of movement within the framework of a global strategy for the development of the oil and gas, mining, and metallurgical businesses, taking into account the risks, opportunities, and new roles in social stabilization in the context of the COVID-19 pandemic and growing geopolitical tensions.

This broad context naturally indicates the scale of the new tasks that must be taken into account, namely:

- on the one hand, updating the risks and opportunities for greening production and social responsibility for enterprises in the Arctic Zone of the Russian Federation;
- On the other hand, the fact that the supporting role of the state as a regulator of conditions for the development of business initiatives by the private sector in the Arctic strengthens the development opportunities and the influence of business on socio-economic processes, but at the same time creates restrictions on business development, the need to ensure a set of security measures - epidemiological and environmental,
- Thirdly, the need to achieve the strategic development goals of the Arctic Zone of the Russian Federation, enshrined in the set of strategic indicators for the development of the Arctic Zone of the Russian Federation, including demographic indicators, the likelihood of achieving which we justified as low (the main target indicators are reflected in the Arctic Zone Development Strategy and the Russian Federation Program "Socio-Economic Development of the Arctic Zone of the Russian Federation"). Taking into account the above, we first had to decide, namely: to determine the conditions for the sustainable development of the Russian Arctic:

to substantiate the problems and prospects for creating conditions for the integrated use of raw materials in the regions of the Russian Arctic

The article presents the results of the examination of the actual readiness and conditions for the participation of large businesses in investment projects for the integrated processing of mineral resources, considered from the perspective of an environmental measure with a potential commercial effect, from the perspective of activating entrepreneurial activity and strengthening the development opportunities of single-industry towns in the Arctic.

The solution to this problem ensures the creation of realistic conditions for the integrated processing of Arctic mineral resources. This solution is a natural continuation of the work undertaken in 2024, which focused on substantiating the conditions for developing entrepreneurial activity in the Arctic in the area of integrated processing of mineral resources:

business models for organizing production are proposed;

A mechanism for their implementation has been developed, for which a roadmap has been developed. The success of this roadmap depends on a detailed understanding of the conditions under which businesses are willing to strengthen their entrepreneurial activity and combine their efforts to ensure the integrated use of mineral resources.

The novelty and increased relevance of the solution to this problem are also ensured by the identified new trends in the development of Arctic territories, including changes in prices and demand for mineral resources, and the conditions for the development of large businesses, already noted in previous chapters, in terms of greening and ensuring

conditions for the development of the territories where they operate. This necessitates a reorientation of some company investment projects toward non-commercial ones, related to the creation of specific environmental infrastructure and the search for methods to reduce the negative impact on the environment. Under these conditions, the challenge is to maintain and increase entrepreneurial activity to achieve the socio-economic development goals of the Russian Arctic and implement the concept of integrated processing of mineral resources.

Main part

Various economic and technological factors related to the current global situation may impede the increase in the rate of reproduction and processing of solid minerals in accordance with the Strategy for the Development of the Mineral Resource Base of the Russian Federation until 2035. A distinctive feature of the current historical stage of national economic development, situated within the global context of changing technological and economic paradigms in the Russian Federation, is the implementation of a strategy for the reproduction of the mineral resource base and the processing of solid minerals in the context of import substitution. To achieve technological sovereignty and provide high-tech industries in Russia with strategic metals and other resources, as well as to address one of the key challenges—improving the efficiency of beneficiation and deep processing of strategic mineral resources of natural and man-made origin—it is necessary to update the practical implementation of the concept of integrated processing of mineral resources.

The list of key strategic mineral resources was approved by a decree of the Government of the Russian Federation.98 Since then, it has been updated several times, but its composition has remained the same. Strategic resources in Russia include: oil, natural gas, uranium, manganese, chromium, titanium, bauxite, copper, nickel, lead, molybdenum, tungsten, tin, zirconium, rare earth metals (tantalum, niobium, cobalt, scandium, beryllium, antimony, lithium, germanium, rhenium, and rare yttrium elements), gold, silver, platinum group metals, diamonds, and high-purity quartz. Currently, the actual situation with each item varies significantly. Most of the strategic materials approved by the Government of the Russian Federation do not rely on imports. The four main mineral resources of greatest concern are uranium, titanium, zirconium, and rare earth metals. The main reasons for the shortages of these resources are:

- low quality of ores, despite significant volumes of reserves;
- structural imbalances in the economy caused by the weak development of high-tech industries and the manufacturing industry;
- the lack of cost-effective technologies for processing complex,multi-component and low-quality ores;
- insufficiency of ongoing geological exploration work.

Solutions to the problem of import dependence determine the need to implement the following projects:

- intensification of geological exploration work to find new deposits;
- development of new known deposits;
- improvement of ore mining and processing technology;
- complex processing of ores, where these elements can be extracted as a by-product;
- development of our own production of final high-tech products and processing industries capable of separating collective compounds into individual commercial elements;
- development of technologies for processing information on the geological structure and reserves of mineral resources.

The measures proposed and currently being implemented to address the issue of self-sufficiency and sufficiency in mineral resources are both extensive and intensive. Given the principles of sustainable development, a rational approach to subsoil use, and the complexity of raw materials, intensive development methods are of greatest interest, namely the development and implementation of new technologies that facilitate the integrated processing of mineral resources. The concept of integrated processing of mineral resources was first discussed in the 1930s. Academician A.E. Fersman can rightfully be considered its founder. His principle, analogous to nature, of locating production facilities so as to extract not individual components, but the entire geochemical spectrum of chemical elements concentrated in a specific area, became the basis for the concept of integrated use of raw materials. Since the 1960s, the accumulation of industry knowledge on the rational use of mineral resources has continued. This period is associated with such scholars as S. G. Strumilin [and others]. In the 1990s, during the transition to a market economy and the formation of private ownership of natural resources, researchers focused on defining the role and place of the state in addressing environmental management issues, developing measures to stimulate the integrated development of mineral resources and the use of mining and processing waste, and on state participation in waste disposal. Scientific research during this period more clearly defined the mining-technological, mining-ecological, and economic (ecological, geological-economic) aspects of environmental management. The mining technology approach, based on the principles of the intensification concept (low-waste, comprehensive use of minerals), was developed in the works of V. N.

Makarov et al. Ecological and economic issues of rational nature management during this period were reflected to the greatest extent in the works of O. F. Balatsky et al. Scientific research of man-made deposits as complex geological objects with significant resource potential was developed (K. N. Trubetskoy et al.). In addition, the need arose for the economic assessment of man-made deposits as investment objects (V. V. Chaynikov et al.). Since the early 2000s, changes have begun in the system of state management of natural resource management. These problems were reflected in the studies of L. Z. Bykhovsky and others. The researchers note the need to systematize information on waste and man-made deposits, their resource potential, systematic environmental and economic assessment and state accounting. In view of the geographical distribution of developed and promising deposits by the identified most scarce and import-dependent types of mineral resources (uranium, titanium, Zirconium and rare earth metals) in the Arctic Zone of the Russian Federation and the Far East (Table 1), the strategic objectives for the development of these territories, and the relevance of the practical application of the integrated processing concept are further increasing today and in the near future. Most projects for the development of promising deposits in the Russian Arctic regions are included in the Strategy for the Development of the Arctic Zone of the Russian Federation and National Security through 2035, approved by Decree of the President of the Russian Federation No. 645 of October 26, 2020. This determines a high responsibility for ensuring the preservation of the fragile ecological balance in the territory of the Russian Arctic, with an emphasis on intensive methods of mineral extraction and processing, including through the use of integrated processing of mineral raw materials at existing and promising deposits. The implementation of these solutions is impossible without intensifying the entrepreneurial activity of economic entities directly involved in their implementation. The term "entrepreneurial activity" (EA) originated in foreign studies of entrepreneurship theory as a synonym for entrepreneurial activity (R. Cantillon, A. Turgot, A. Smith), then evolved into the category of personality traits (A. Marshall, T. Veblen, J. Schumpeter), which can have different types of manifestations (. Further, the concept of a qualitative characteristic of entrepreneurial activity took the form of a quantitative indicator (Global Entrepreneurship Monitor, GEM project) in the form of an integral value - as a synthesis of the results of economic activity. In domestic studies, the path of development of this term was similar, and currently, as abroad, the most authoritative study is the GEM project, in which Russia has been participating since 2018.Turgot, A. Smith), then evolved into the category of personality traits (A. Marshall, T. Veblen, J. Schumpeter), which can manifest in various ways (. Further, the concept of a qualitative characteristic of entrepreneurial activity took the form of a quantitative indicator (Global Entrepreneurship Monitor, GEM project) in the form of an integral value - as a synthesis of the results of economic activity. In domestic studies, the path of development of this term was similar, and currently, as abroad, the most authoritative study is the GEM project, in which Russia has been participating since 2018.Turgot, A. Smith), then evolved into the category of personality traits (A. Marshall, T. Veblen, J. Schumpeter), which can manifest in various ways (. Further, the concept of a qualitative characteristic of entrepreneurial activity took the form of a quantitative indicator (Global Entrepreneurship Monitor, GEM project) in the form of an integral value - as a synthesis of the results of economic activity. In domestic studies, the path of development of this term was similar, and currently, as abroad, the most authoritative study is the GEM project, in which Russia has been participating since 2018.

At the same time, despite the fact that all researchers postulate the multifaceted nature of entrepreneurial activity, existing theories often take a one-dimensional approach to its study, primarily viewing it as the entrepreneurial activity of the population. A one-dimensional approach to studying the concept of entrepreneurial activity from the perspective of only one market participant leads to a correspondingly one-dimensional selection of indicators used as the basis for its calculation methods. This approach does not allow for a comprehensive assessment of the level of entrepreneurial activity. Existing studies examine it primarily at the national level, while regional studies are limited to individual regions or their rankings, compiled by various agencies based on their own methodologies.

Table 1. Geographical distribution of existing and prospective deposits of import-dependent mineral resources by regions of the Russian Federation

Mineral raw materials	Regions with operating deposits		Regions with promising deposits	
	Regions of the Arctic Zone of the Russian Federation	Other regions	Regions of the Arctic Zone of the Russian Federation	Other regions

Uranus	Republic of Sakha (Yakutia)	Transbaikal Territory, Republic of Buryatia, Kurgan Region	-	Amur Oblast, Jewish Autonomous Oblast, Transbaikal Krai
Titanium	Murmansk region, Komi Republic	-	Murmansk region	Tomsk region, Transbaikal Territory, Amur region, Chelyabinsk region
Zirconium	Murmansk region	-	Komi Republic	Tomsk region, Irkutsk region
Rare earth metals	Murmansk region	-	Republic of Sakha (Yakutia),Krasnoyarsk Territory, Komi Republic	-
Fluorspar	-	Transbaikal Territory, Republic of Bashkortostan, Republic of Buryatia	Republic of Sakha (Yakutia),Krasnoyarsk Krai	Primorsky Krai

In addition to the understudied regional aspect, the multifaceted nature of entrepreneurial activity from the perspective of each economic agent operating within the regional economic system—namely, the population, businesses, and the state—has not been fully explored. This is a key prerequisite for the need to change the approach to studying entrepreneurial activity, driven by contemporary scientific trends associated with the transition from a traditional economic view of entrepreneurship, focused on markets, to a new economic perspective emphasizing people, networks, and institutions. In this regard, in our previous studies, we proposed the following definition of entrepreneurial activity: a comprehensive, integrated indicator reflecting the intensity of participation in entrepreneurial activity by all economic entities (households (population), businesses, and the state), the synergistic effect of whose interactions will determine the level of development and specific features of entrepreneurial activity in a particular territory. In accordance with this definition, we proposed using a multivariate average method for calculations for each identified type of entrepreneurial activity (population, businesses, and the state). The calculations made it possible not only to assess the current state of entrepreneurial activity, but also, based on these calculations, to draw a conclusion about the predominant strength of participation of a specific economic agent in the economy of a particular region and to create a “heat map” of entrepreneurial activity in Russia by region, classifying them by the level and type of its manifestation (Figures 1 and 2).

Taking into account these characteristics of the manifestation of entrepreneurial activity in the regions was defined as the basis for the formation of a regional policy for managing the region's economy and the selection of the most appropriate strategies and instruments for stimulation and development, including in relation to a specific industry.

Companies participate in the extraction and/or production of a new valuable component (which is a finished or intermediate product), as well as in the creation of new enterprises to implement projects necessary for the development of the mining and processing industry, and their participation can be both direct and indirect.

Direct participation includes the direct establishment of a new company through a contribution to its authorized capital, while indirect participation involves the creation of conditions that facilitate the creation or emergence of new business structures.

All market actors—business, government, and the public—can participate in these processes, both independently and jointly, determining the level and type of entrepreneurial activity in the region.

There is no clear consensus regarding who should become the driving force in the integrated processing of mineral resources and the appropriate forms of implementation. Potential business management concepts applied by domestic and international companies regarding the leading market player are discussed.

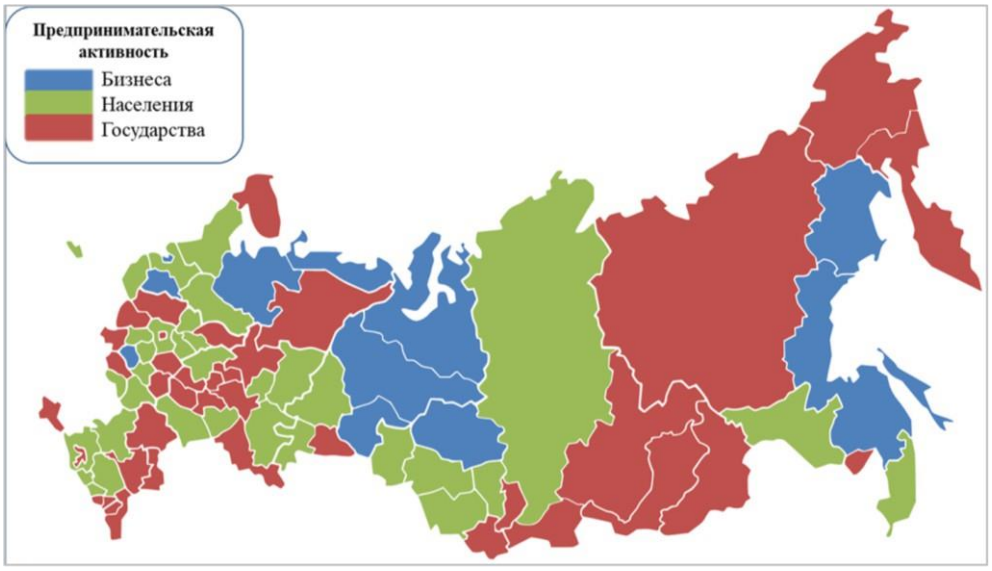


Figure 1. Distribution of entrepreneurial activity by predominant types in the regions of the Russian Federation, 2018

Figure 2. Distribution of regions of the Russian Federation by level of entrepreneurial activity, 2024

According to previous calculations of the level and type of PA, it has been established that in the regions of the Arctic Zone of the Russian Federation, whose territory is fully included within it, entrepreneurial activity is predominantly carried out by the state and business, while in the partially Arctic regions, it is carried out by the state and the population. Taking into account this regional characteristic and the corresponding concepts of economic management for the implementation of the integrated processing of mineral resources relative to the leading economic agent (population, business, state), the following conclusion can be formulated: for the intensification of entrepreneurial activity in the mineral extraction and processing industry in the fully Arctic Russian regions, the most optimal concepts will be internal outsourcing, the creation of a technology park with state participation, and the establishment of new business structures based on public-private partnerships. In the partially Arctic Russian regions, the development of small and medium-sized mining businesses with state support will be the most optimal (Table 2). Thus, despite the Russian Federation's significant mineral resource reserves, there are areas that require particular attention given global geopolitical changes and the need to develop high-tech industries within the country to ensure the independence and self-sufficiency of the national economy and maintain its stable, sustainable development. This issue can be

addressed through the use of both extensive methods related to the exploration and development of new deposits and intensive approaches, including the improvement of mineral extraction and processing technologies to ensure sustainable environmental management and the comprehensive extraction of all valuable components, as well as the development of systems and tools for working with this information. Given the geographical distribution of import-dependent and strategically important mineral resources across the regions of the Russian Federation, primarily located in the Arctic zone and the Far East, the practical application of integrated mineral resource management concepts is currently increasingly relevant due to the high level of environmental responsibility in these regions.

Implementing the concept of integrated use requires intensifying entrepreneurial activity among economic entities in the mining and processing industries, necessitating the development of an appropriate regional business environment management policy that takes into account the specifics of economic activity and entrepreneurial activity within a given region. Taking these regional characteristics into account has allowed us to develop a pool of business management concepts that are most applicable to the implementation of integrated processing of mineral resources in the Arctic Zone of the Russian Federation. Thus, in fully Arctic regions, intensifying entrepreneurial activity is possible through internal outsourcing, the creation of a technology park with state participation, and the establishment of new business structures based on public-private partnerships. In partially Arctic regions, this can be achieved through the development of small and medium-sized mining businesses with state support.

Further focusing on these concepts requires identifying corresponding business models and specific tools for intensifying entrepreneurial activity that facilitate their practical implementation.

Table 2. The correlation between business management concepts for the implementation of integrated processing of mineral resources and the prevailing type of entrepreneurial activity in the regions of the Arctic Zone of the Russian Federation, 2024.

Subject of the Russian Federation	Population	Business	State	General level	The predominant type of entrepreneurial activity	Concepts of business management
Completely Arctic regions						
Murmansk region	0.22	0.32	0.35	0.89	State	PPP, clusters, technology park
Yamalo-Nenetsautonomous district	0.16	0.90	0.31	1.36	Business	Large mining companies, subcontracting and outsourcing
Chukotka Autonomous Okrug	0.01	0.08	0.11	0.20	State	PPP, clusters, technology park
Partially Arctic regions						
Republic of Karelia	0.31	0.29	0.29	0.89	Population	Small and medium-sized mining businesses
Komi Republic	0.29	0.32	0.41	1.01	State	PPP, clusters, technology park
Krasnoyarsk Krai	1.42	1.06	1.37	3.84	Population	Small and medium-sized mining businesses
Republic of Sakha (Yakutia)	0.45	0.75	1.31	2.51	State	PPP, clusters, technology park
Arkhangelsk region and the Nenets Autonomous Okrug	0.44	0.55	0.43	1.42	Business	Large mining companies, subcontracting and outsourcing

The term "business model" first appeared in 1960. Its use in Russian management practice began in the 2000s. Its popularity subsequently increased. Currently, academic sources, both foreign and domestic, offer numerous interpretations of this term. For example, a review of the literature on business models showed that the definition has evolved over time, but the fact remains that a business model is a

way of conducting business, a way for a company to generate profit through the use of its resources or assets (Table 3). A business model itself is a logical framework for describing the interactions between its elements.

Table 3. An overview of the main definitions of the term "business model"

Author	Definition
K. Prahalad, In Ramaswamy [	The business model concept is a unified unit of analysis that helps understand the process of value creation, which is the result of engaging many types of resources and the outcome of many processes. An organization's business model is the logic behind the integration of resources and capabilities to consistently achieve its fundamental goals and conduct business activities. Furthermore, it is proposed that this configuration of resources and capabilities allows the firm to create unique value.
P. Timmers]	A business model consists of a set of products, services, and information flows, as well as a description of the various participants in the business process, their role in the value chain, potential benefits, and revenue streams. To understand the company's business mission, a marketing model is added, which integrates the business models and marketing strategies of the target business entity.
J. Linder and Cantrell S. [	Business model as the main logic of creating added value in a company. They distinguish three types: component business models, operating business models and change models.
J. Gorjizhn	Term"business model" is often misunderstood and confused with the term "business process model". They try to describe the business model using modeling languages: UML, EPC, Petri nets

Continuation of Table 3

P. Ville, M. Vital]	A business model is a description of the roles and relationships of customers, partners, and suppliers that identifies the main supply channels, products, information flows, and cash flows.
O. Petrovik, K. Kittle	Business model as a logic of value creation in a business system
L. Applegate	A business model is a description of a complex business system that allows one to study its structure, the relationships between its structural elements, and how this system will interact with the real world.
P. Steichler]	A business model is a conceptual description that explains how a business operates. A model is always a simplification of a complex reality. It helps to understand the fundamentals of a business or plan what that business should be like.
A. Slivotsky	A business model is how a company selects a customer, formulates and differentiates its offerings, allocates resources, determines which tasks it can perform internally and which it will outsource, enters the market, creates value for the customer, and profits from it. Companies may offer products, services, or technologies, but this offering is based on a comprehensive system of actions and relationships that constitutes the company's business model.
M. Rappa [Rappa, 2006]	A business model is a way of operating a business that generates revenue and profit. A business model formally reflects the process of earning money, defining its disposition and role in the value chain in detail.
J. Funder	A business model can be defined as a sustainable method of running a business.
G. Hamel	A business concept and a business model are cut from the same cloth: a business model is simply a business concept brought to life. A successful business model generates its own intellectual hegemony.

Chesborough G.	Business model- is the method a company uses to create value and make a profit
A. Osterwalder, I. Pigneur	A business model is an abstract conceptual model that illustrates the logic of creating added value (profit)

End of table .3

A. Osterwalder, I. Pigneur	A business model is a representation of how an organizationmakes (or intends to make) money. A business model describes the value an organization offers to various customers, reflects the organization's capabilities, the list of partners required to create, promote, and deliver this value to customers, and the capital relationships necessary to generate sustainable revenue streams.
Z. A. Avlasko	To radically improve the efficiency of operationsEnterprises using a process-based approach to management do not necessarily need to use revolutionary production technologies or create fundamentally new products; it is sufficient to use new approaches to organizing the functioning of key areas of the business model
S. I. Mezhov, A. V. Boldenkov	A business model is a logical, schematic description of a business designed to help evaluate the key factors of a company's success. The goal of business modeling is to create a reliable, visual, and easy-to-understand description of a company's activities. This can be a drawing, diagram, or 3D model, all drawn according to certain rules. The most important thing is clarity and applicability.
L. N. Semerkova, N. G. Ostroukhova	In new business models, value will be created through attracted assets, and some business processes will be performed by specialized enterprises

Research into business models in relation to the concept of integrated processing of mineral resources, in the modern interpretation of the term "business model," originates from the ideas of V. I. Vernadsky and A. E. Fersman, which postulated the need for a harmonious coexistence between man and nature, including through the rational use of natural resources, expressed in the extraction of all valuable components from the extracted raw materials.

The first scheme of complex processing - a closed cycle scheme for the complete use of materials (Figure 3) was proposed by V. A. Reznicenko and A. A. Morozov and presented at the “Materials Week” in Chicago (USA).

It was later improved by A. D. Verkhoturov from the point of view of orientation towards future technologies of processing mineral raw materials through its decomposition by concentrated energy flows without preliminary separation of the minerals contained in it and without enrichment.

The basis for its implementation was the creation of mini-factories at raw material extraction sites. This scheme was called an open (ideal) cycle of complete material utilization (Figure 4).

Figure 3. Complete material utilization cycle.

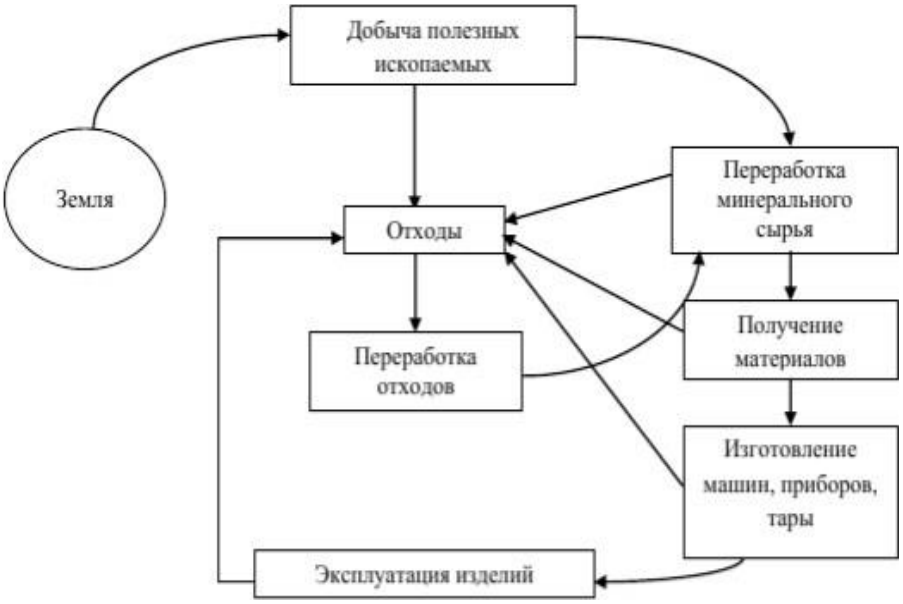


Figure 4. Open loop of full material utilization.

In the works of F. D. Larichkin, one of the authoritative modern researchers of the problem of integrated processing of mineral resources, it is shown that "the nature of the synergistic effect of the integrated use of multicomponent raw materials can be identified and clearly presented by examining the fundamentally possible models of individual (single-product), integrated (conglomerate type), and combined (complex) production organized on the basis of a deposit of multicomponent mineral raw materials" (Figure 5). A key feature of the models under consideration is that they are implemented within the framework of a single enterprise and directly by it. It is argued that "the expansion of the range of extractable useful components during the processing of multicomponent raw materials is accompanied by the transformation of only part of the processing capacities at the beneficiation stage or, most often, only in the final chemical-metallurgical operations of processing concentrates, semi-finished products, and intermediate products. At the same time, there is no need to increase the volume of raw material extraction, and, accordingly, no additional investments or ongoing costs associated with the preparation of the raw material base, mining operations, and the initial stages of preparing raw materials for processing (crushing, grinding, classification, etc.).

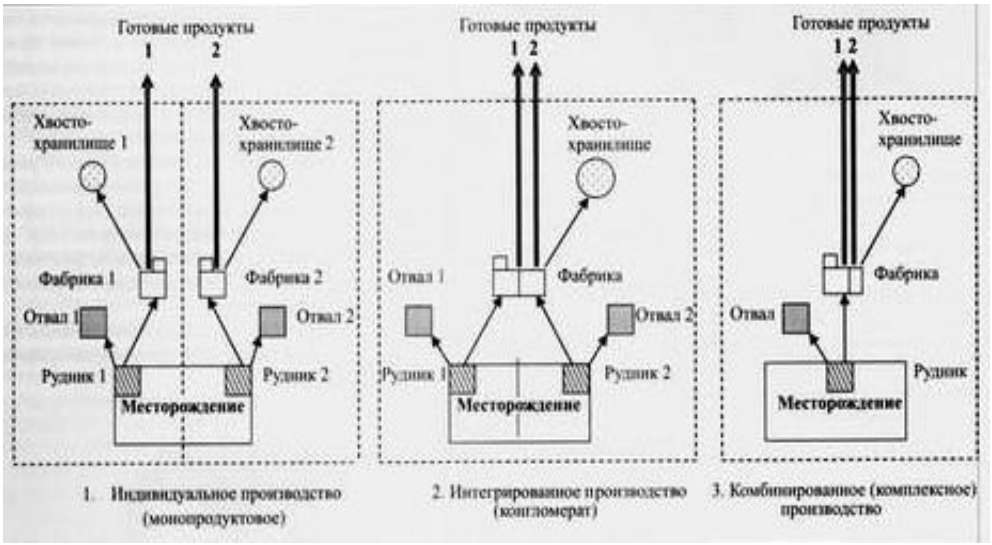


Figure 5. Types of fundamentally possible production models using a deposit of multicomponent mineral raw materials.

At the same time, the economic entity still bears costs associated with the "conversion of a portion of its processing capacity." Furthermore, the creation of an additional processing stage will lead to increased operating costs associated with hiring additional workers, increased repair costs, and the purchase of necessary reagents for the technological process, which will ultimately impact metrics such as productivity and production costs. In today's environment, reducing production costs and increasing productivity are key priorities for many large companies listed on international stock exchanges. In such a situation, the economic interests of investors and shareholders may conflict with the goals of rational use of mineral resources through their comprehensive processing. Therefore, a solution to this situation appears to be the need to develop the proposed models by involving other economic entities in these processes and establishing partnerships. As a result of this approach, production models using a multi-component mineral deposit will take the form shown in Figure 6.

Implementation of business model A "Involvement of economic entities in mining processes" may be adopted in the presence of unused deposits with small reserves, the exploitation of which within the framework of large businesses is unprofitable, and provided that it is possible to process the extracted ore at the existing capacities of the main business's factories.

Implementation of business model B "Involving an economic entity in processing" occurs when the mined ore contains an additional volume of a valuable component that is unprofitable for independent extraction within the current production process, but has potential market demand as a finished or intermediate product. It is worth noting that the creation of such an additional processing facility can be based on the infrastructure of an existing production facility, which will reduce initial capital investment for its construction, transportation costs during operation, and the environmental impact through the use of existing tailings storage facilities.

Implementation of business model C "Ensuring integrated processing by engaging economic entities in both mining and processing" is possible in the presence of unused, small-scale deposits whose exploitation by large businesses is unprofitable and in the absence of existing processing facilities for the extracted ore raw materials.

When considering the practical nature of the presented business models in relation to the problem of moving away from import dependence on strategic mineral raw materials using the example of apatite-nepheline ores of the Khibiny deposits located in the Murmansk region, a conclusion was reached on the possibility of their implementation, taking into account the accumulated scientific groundwork for processing technologies, established trends in corporate management of production and business, as well as in connection with the increasing demands for environmental safety and the global geopolitical changes taking place in the world.

The Khibiny apatite-nepheline ore deposit is distinguished by the diversity of its valuable components and complex composition. It is a source of phosphates, nepheline, sphene, titanomagnetite, and several other valuable rare earth elements. Developed apatite-nepheline ore beneficiation processes allow for the production of concentrates of the main minerals (nepheline, sphene, titanomagnetite, and aegirine), as well as a variety of products for a variety of applications, including those in high demand—rare metal compounds, pigments, sorbents, coagulants and flocculants, construction and welding materials, etc.

A. Involvement of an economic entity in the extraction processes	**B. Involvement of an economic entity in processing processes**	**C. Ensuring comprehensive processing by involving economic entities to both mining and processing processes**

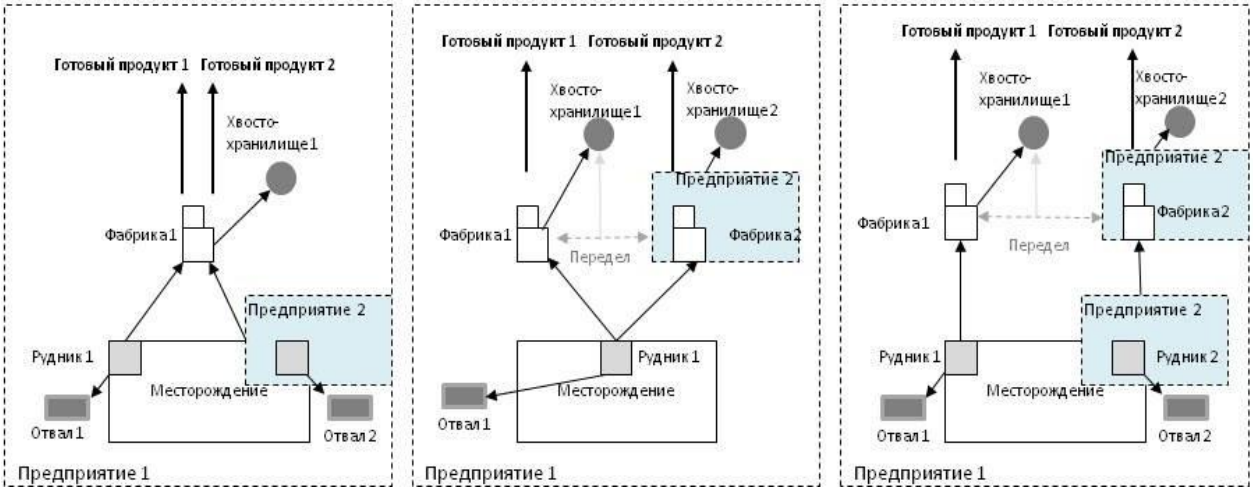


Figure 6. Business models for organizing production in the integrated processing of mineral resources with the involvement of other economic entities.

Table 4. The relationship between technological schemes for processing apatite-nepheline raw materials and business models for organizing production in the complex processing of mineral resources with the involvement of other economic entities

Raw materials	Production process	Finished product	Business model
Nepheline concentrate dust	Preliminary laser cleaning with the introduction of alloying elements by the sorption method [New welding..., 2010]	Coating of welding electrodes	B
Titanomagnetite concentrate	Pyrometallurgical processing with ilmenite and sulfuric acid [Shchelokova et al., 2018]	Pigmentedtitanium dioxide	B
Gremyakha-Vyrmes deposit	Mining and processing [Chemical processing…, 2003]	Ilmenite	A
Sphene concentrate	Beneficiation and hydrometallurgical method [Chemical processing…, 2003]	Titanium sorbents	B
	Purification of radionuclides by removing perovskite using enrichment methods [Purification of sphene…, 2014] and products of its chemical processing according to the sulfuric acid scheme	Titanium sealants	B
Unevaporated extractionphosphoric acid	Processing within the existing production by means of sorption using the strongly acidic macroporous cation exchanger Purolite C-150, carried out in the temperature range of 40–80 °C and corresponding to the operating parameters of the production process at the enterprise, washing the sorbent saturated with the sum of rare earth elements with water, desorption with a solution of ammonium nitrate with the production of a commercial desorbate and subsequent extraction purification of the resulting desorbate with	REE	B

	100% tributyl phosphate [Nechaev, Polyakov, 2020]		

Taking into account the priority objectives of developing the mineral resource base, which are related to organizing small-scale production of products in demand on the domestic market—namely, inorganic sorbents, electronic materials, titanium dioxide-based sealants, functional rare metal compounds, and rare metal powders for capacitor and other industries—existing production processes were analyzed relative to the identified business models. The results of this analysis are presented in Table 4.

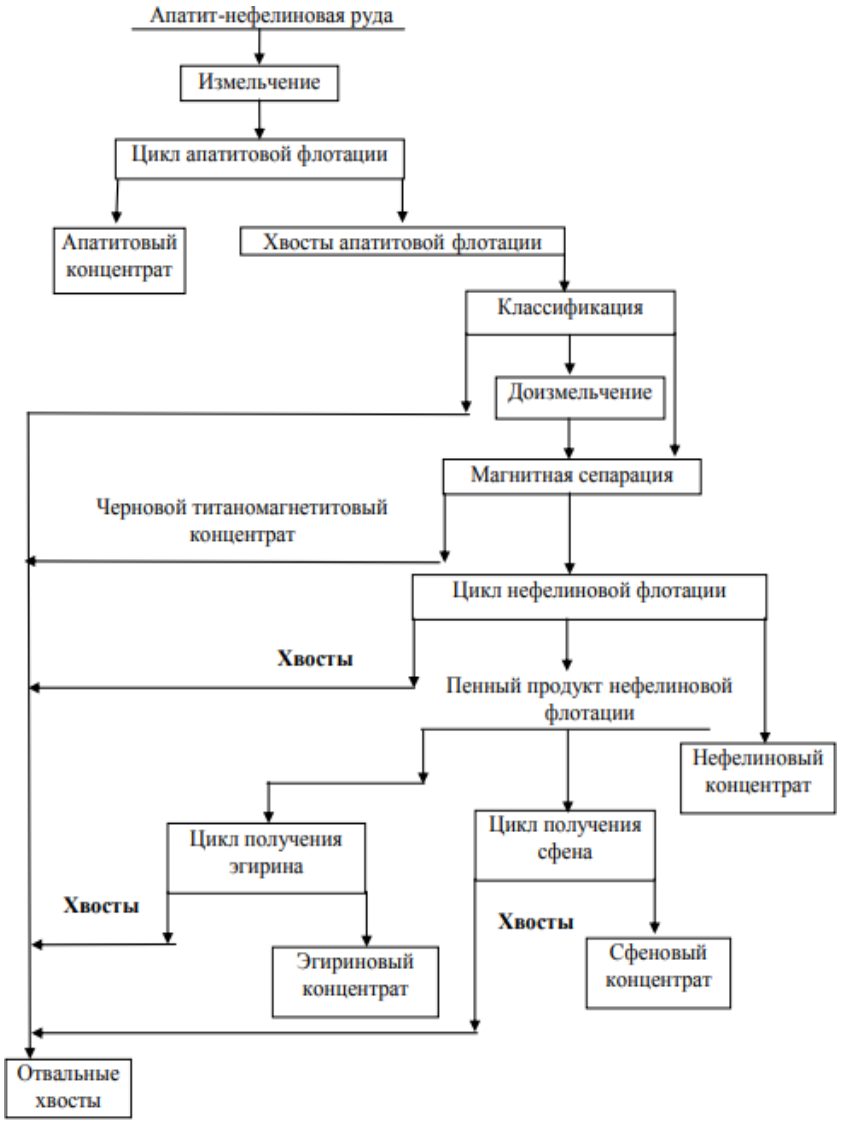


Figure 7. Scheme of production of concentrates at JSC Apatit.

Sources of these products may include current and accumulated waste from mining and processing facilities, by-products generated during primary production, and a wide range of explored deposits on the Kola Peninsula currently unused by industry. From this perspective, business models B and A, respectively, are the most promising for the Khibiny deposits.

Business Model B will determine the need to create additional production conversions to the current technological process for the production of concentrates at JSC Apatit and gaining access to process waste, which serves as raw material for the next stage of production (Figure 7).

Business Model A will be adopted if it is necessary to obtain access to deposits for the organization of production and primary processing there.

In both cases, these conditions in practice become key issues in the search for both the performers of this process and the definition of the mechanism of interaction between them.

Direct contractual relations of "lease", "purchase and sale", "subcontract" These projects are becoming practically unfeasible due to emerging institutional barriers (defining property rights, gaining access to industrial deposits and production waste), economic assessments (regarding pricing and cost calculations), and the risk of losing control over both the processes and the complex as a whole. For this reason, it becomes necessary to change the mechanism of interaction between economic entities within business models, allowing for the elimination of existing barriers and ensuring systemic management of the complex as a single, unified entity.

Such instruments have already been widely used globally. These include the standard Joint Operating Agreement (JOA), developed by the Association of International Petroleum Negotiators (AIPN) and used globally in hydrocarbon field development. Russian oil companies are developing fields outside the Russian Federation based on such terms in contracts previously concluded under English law, including for the implementation of Russian projects involving foreign partner companies.

The sanctions imposed against the Russian Federation prompted legislators to seek solutions regulating such contractual structures, taking into account the specifics of the Russian economy. As a result, on April 1, 2022, Federal Law No. 75-FZ “On Agreements Concluded in the Implementation of Geological Survey, Exploration, and Production of Hydrocarbon Raw Materials, and on Amendments to the Law of the Russian Federation” was adopted.

"On Subsoil Resources." This regulatory act aims to create legal conditions in the Russian Federation for the joint implementation of oil and gas projects, including offshore ones, and to stimulate investment in this sector. It provides for the possibility of concluding two types of agreements:

- service risk agreements (SRA);
- Financial Management Agreements (FMA) - for cases where there is no need for all project parties to participate in the FMA.

The practical application of the adopted Federal Law on the SSR raises many questions and comments among business entities and the public, including:

1. The problem of classifying a joint venture agreement is that a joint venture agreement is similar in nature to a joint venture agreement or a simple partnership agreement. In circumstances not regulated by the Federal Law on Joint Venture Agreements, they are governed by Russian subsoil legislation and the Civil Code. However, the lack of a clear indication that a joint venture agreement is a type of joint venture agreement may give rise to disputes regarding the application of the provisions of the Russian Civil Code on joint venture agreements to joint venture agreements.
2. Inconsistency with internationally accepted standards—the organizational and legal model (JAA and SUA) differs significantly from the standard provisions of the Joint Activity Agreement developed by AIPN. Specifically, the parties to the JAA must always be a subsoil user and an operator, who cannot be a subsoil user, while the operator, in turn, can enter into a separate agreement with financial investors. This multi-step scheme creates difficulties in monitoring its implementation, financial, and tax accounting. It would be advisable to align the JAA agreement with the generally accepted standard AIPN Joint Activity Agreement, which requires only a single agreement in which the operator, the license holder, and financial investors not involved in mineral extraction jointly participate, and to allow the license holder to also act as the project operator.
3. Unclear division of responsibility—financial responsibilities for SSR participants are insufficiently defined, creating additional risks for parties not engaged in mineral extraction activities. Under the existing operating model, these parties bear limited liability proportional to their investment in the joint venture, which operates as a legal entity within the relevant licensed blocks. This, in turn, will further complicate the search for and attraction of investors and will hinder the practical implementation of the federal law.
4. Generalization of the compensation mechanism - more detailed information is requiredA description in federal law of the procedure for compensation for damages, taking into account the specifics of the oil and gas sector and the general provisions of the Civil Code of the Russian Federation.
5. Tax regulation of activities under SSR agreements - the introduction of the federal law necessitated the introduction of conceptual changes to tax legislation for its practical implementation, in terms of excluding activities under SSR agreements from the procedure for calculating VAT and income tax, which initially (at the first initiative of the bill in 2015) were a barrier to the approval of the bill. In the context of sanctions against the Russian Federation and a decline in investment activity (due to the departure of foreign partner companies), the relevance of the bill on SSR increased. Its introduction in 2021 without amendments to the Tax Code of the Russian Federation, which the Ministry of Finance opposed, showed the impossibility of implementation, in connection with which the Federal Law "On Amendments to Part Two of the Tax Code of the Russian Federation"99 FZ-No. 22 was adopted on February 17, 2023, allowing for the provision of benefits on VAT and income tax. This, in turn, made the work of the adopted.

The law regulating the conclusion of service risk

agreements and financing management for geological exploration, prospecting, and production of hydrocarbons is currently in effect. Such innovations raise concerns due to the highly likely shortfall in federal budget funds and the further enrichment of oil and gas companies, as well as the continued trend toward an extensive approach to subsoil use and the failure to address the issue of integrated mineral resource utilization. To address these risks, it is necessary to clarify the subject of the agreement, namely, the types of projects for which the application of SSR and SSF will be possible. Such projects in the oil refining sector should include projects involving unfinished wells, geological exploration, processing, and the extraction of associated raw materials and other non-core valuable components. This approach will allow for a clearer distinction between the core activities of extracting and processing the main component and the activities of rational use of the mineral resource base and will create the basis for the possibility of a financially secure extension of the practice of using SSR and SSF agreements to other strategically important mineral elements for which there are the greatest risks of import dependence.

6. The uncertainty of the contract's duration, i.e. the lack of specifics According to this regulation, on the one hand, it creates risks of transferring project activities to a permanent work format, which, in the context of the introduced tax incentives, causes budgetary risks; on the other hand, the standard adopted corporate policy on short-term contractual relations (up to 1 year) can lead to transaction costs for companies when renewing such contracts.

7. The unequal position of the subsoil user and the operator—the provision on the termination of contracts—creates an advantage for the subsoil user and disproportionately worsens the position of operators, which may cause difficulties in their involvement and the practical implementation of the law on SSR.

Thus, the work already begun to regulate the activities of subsoil users, in terms of defining the mechanism for their interaction, requires further clarification and improvement. At the same time, it is necessary to strengthen the systematic nature of the adopted decisions on SSR and SSF agreements, expand their application to the entire mineral resource base, and clarify the purpose of such activities to ensure the minimization of the risks of import dependence for strategic mineral resources, the development of high-tech industries as consumers of mineral raw materials, and environmental safety in the context of rational nature management.

According to the authors, increasing the systemic nature is seen in the creation of a mechanism for network interaction between economic entities in the mining and processing complex, implemented through a corresponding agreement.

The essence of such contractual relationships lies in the transfer of part of the processes to another economic entity without losing control of the process and in obtaining the required finished product. Supply and demand relationships are formed within the complex and can be regulated by the state through the use of various targeted regulators to adjust the operating conditions of the complex as a single management entity. The operation of a mining and processing complex under a network cooperation agreement is schematically depicted in Figure 8.

A resource base holder (hereinafter referred to as a RRB) is a mining and processing enterprise licensed to develop specific deposits. During the development of a technology for extracting valuable components from extracted minerals, the RRB holder independently assesses the adequacy of its own resource, the feasibility and feasibility of its creation, or the need to engage the resources of a participating organization.

The network agreement then has three execution options:

1) the holder of the RSB is the base organization;

2) the holder of the RSB is a participating organization;

3) The holder of the RSB is a partner organization.

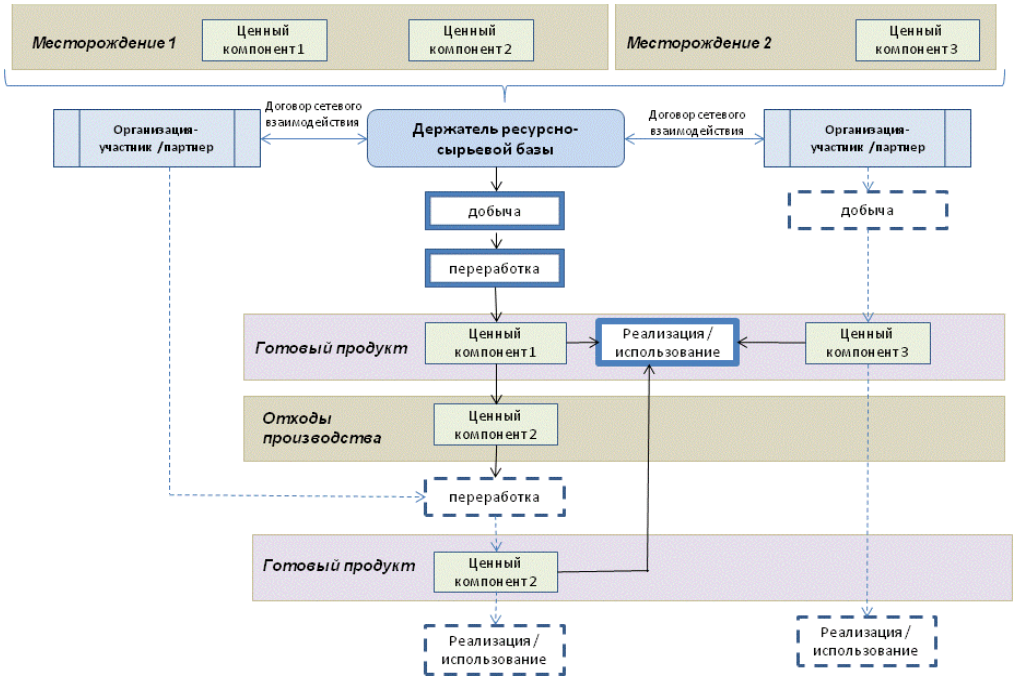


Figure 8. Scheme of organization of a mining and processing complex based on the mechanism of network interaction.

All aspects of the difference between a network interaction agreement and standard civil law agreements of subcontract, cooperation, lease and purchase and sale are presented in Tables 5–7.

The proposed methods could serve as the basis for the practical implementation of processing tailings generated during the production of apatite-nepheline concentrate, producing finished products such as inorganic sorbents, electronic materials, titanium dioxide-based sealants, functional rare metal compounds, and rare metal powders for capacitor and other industries, for subsequent use and for in-house production or sale as finished goods. Implementation of the proposed models would also facilitate the attraction of economic entities to the region or the creation of new enterprises.

Table 5. Comparison of a network interaction agreement with a subcontract agreement

Criteria for comparison	Network Interaction Agreement (the holder of the RSB is the base organization)	Subcontract agreement
Subject of the agreement	Assignment to another party - execution of work on converting production waste into a new finished product with its subsequent transfer to the base organization	
Conditions of execution		
Rights and obligations of the parties	Establishment of production at the location of the base organization using its infrastructure	Production is located at the location of the contractor
Financial support	The contract price consists of the cost of organizing production	The contract price includes costs: • for the logistics of delivering raw materials to the processing site; • for production and shipping
Contract term	Long-term - for a planning horizon of 10 to 30 years	Short term - until the obligations are fulfilled

Table 6. Comparison of a network interaction agreement with a lease and/or purchase agreement

Criteria for comparison	Network Interaction Agreement (the holder of the RSB is the participating organization)	Lease agreement / purchase agreement
Subject of the agreement	Provision of production capacity/production waste for the production of a specific finished product	
Conditions of execution		
Rights and obligations of the parties	An obligation of one party to provide and pay for the provided resources of a certain quality and quantity if the other party is obligated to organize additional production to extract a new valuable component	An obligation to provide and pay for the provided resources of a certain quality and quantity
Financial support	Preferential terms for leasing capacities and selling raw materials in the form of mutual offsets for the amount of investments in the creation of an additional production process	Market value of rent/sale of raw materials
Contract term	Long-term - for a planning horizon equal to at least the payback period for investments in the creation of a new process stage	Short term - until the obligations are fulfilled

Table 7. Comparison of a network interaction agreement with a cooperation agreement

Criteria for comparison	Network Interaction Agreement (the holder of the RSB is a partner organization)	Cooperation agreement
Subject of the agreement	Organization of joint production for the extraction of a new valuable component	
Conditions of execution		
Rights and obligations of the parties	Obligations of each party to organize and carry out production with the right to an equal share of the volume of the finished product	Provide mutual assistance for the organization and implementation of activities
Financial support	The price of the finished product if additional volume needs to be purchased at a partner organization	Situational definition in additional agreements
Contract term	Until one of the parties refuses to continue the relationship	Until the goal of cooperation is achieved

To stimulate entrepreneurial activity, the creation of appropriate, targeted government regulations is also necessary. Generally, such regulations may include special economic regimes and their extension to the mining and processing industry as a whole, including tax incentives at all levels and various social programs for staffing (housing, education, migration, etc.). The mechanism for providing these incentives may be determined by the requirement to sign an agreement on joining the mining and processing industry and a network cooperation agreement for the implementation of the business model defined above. The development of specific regulations requires an analysis of the external environment and an assessment of the readiness of economic entities to implement such activities.

To determine the factors that hinder or, conversely, facilitate to increase entrepreneurial activity in the field of integrated processing of mineral resources in the regions of the Arctic Zone of the Russian Federation through the application of proposed business management concepts, the PEST analysis method was applied.

Among the political factors (P), it is primarily worth noting the state's recognition of the strategic importance of the Russian Arctic territories and the

adoption of a number of fundamental documents on its development over the past six years. These include, first and foremost, the decrees of the President of the Russian Federation of May 2, 2014.

No. 296 "On the Land Territories of the Arctic Zone of the Russian Federation", dated March 5, 2020 No. 164 "On the Fundamentals of State Policy of the Russian Federation in the Arctic for the Period up to 2035", dated October 26, 2020 No. 645 "On the Strategy for the Development of the Arctic Zone of the Russian Federation and Ensuring National Security for the Period up to 2035"; Federal Law of July 13, 2020.

No. 193-FZ "On state support for entrepreneurial activity in the Arctic zone of the Russian Federation"; Resolutions of the Government of the Russian Federation of September 2, 2020 No. 1338 "On approval of the Rules for the provision of subsidies from the federal budget to reimburse expenses for the payment of insurance premiums incurred by legal entities and individual entrepreneurs who are residents of the Arctic zone of the Russian Federation", dated March 30, 2021 No. 484 "On approval of the state program of the Russian Federation "Socio-economic development of the Arctic zone of the Russian Federation", as well as other amendments to legislative acts in connection with the entry into force of these regulatory documents.

Regarding the problem of developing entrepreneurial activity in the territory of the Arctic Zone of the Russian Federation, the most indicative are: Federal Law

"On state support for entrepreneurial activity in the Arcticzone of the Russian Federation" (came into force on August 13, 2020); Decree

The President of the Russian Federation "On the Strategy for the Development of the Arctic Zone of the Russian Federation and Ensuring National Security for the Period up to 2035" and the Resolution of the Government of the Russian Federation "On Approval of the State Program of the Russian Federation "Socio-Economic Development of the Arctic Zone of the Russian Federation".

The aforementioned regulatory documents place a primary emphasis on stimulating entrepreneurial activity in the Arctic—the emergence of new economic entities willing to invest in the development of the business areas identified by the government. To this end, the entire land portion of the Arctic Zone of the Russian Federation is being designated a special economic zone, offering significant preferences to newcomers and existing economic entities diversifying their operations. The adoption of Federal Law No. 193 of July 13, 2020, is in line with one of the objectives set out in the Arctic Zone Development Strategy to 2035: "the implementation of a special economic regime in the Arctic zone that facilitates the transition to a closed-loop economy, private investment in geological exploration, the creation of new and the modernization of existing industrial production facilities, the development of science-intensive and high-tech industries, the development of new oil and gas provinces, solid mineral deposits, and hard-to-recover hydrocarbon reserves, and the expansion of deep oil refining, liquefied natural gas, and gas chemical production."

The Arctic Zone Development Strategy to 2035 also defines the following mechanisms for achieving these objectives: providing state support to investors for capital investments in transport, energy, and engineering infrastructure; simplifying the process for allocating land plots to citizens for economic and other legally permitted activities; and creating and developing a new model for implementing economic projects on the continental shelf, which provides for increased private participation in such projects while maintaining state control over their implementation. In addition to the economic component, the solution to the problem of integrated processing of mineral resources within the framework of the Strategy is determined by the objectives of ensuring the environmental friendliness of economic activity in the Arctic and preventing negative environmental impacts during the development of natural resources.

At the same time, researchers studying the problem of integrated processing of mineral resources note institutional barriers as one of the main barriers to the implementation of this concept. These barriers are associated with the "imperfection, fragmentation (lack of systemic nature) and inconsistency of Russian natural resource legislation, the system of state regulation of subsoil use processes (including taxation) in general and the integrated use of subsoil resources in particular. Active normative work in the field of subsoil use regulation, which began with the adoption of the Strategy for the Development of the Mineral Resource Base in 2015, made it possible to remove most of the identified restrictions and create a basis for the application of new tools and mechanisms of interaction by economic entities. The primary emphasis is placed on hydrocarbon raw materials. They are also the focus of the Strategies for the Development of the Mineral Resource Base and the Development of the Arctic Zone of the Russian Federation, which coincide in terms of solving the problem of replenishing mineral resources by intensifying geological exploration while stimulating private investment. This imbalance overshadows other types of solid minerals, as well as addressing stated environmental challenges, particularly the problem of accumulated man-made deposits. The amendments to the Arctic Development Strategy to 2035 add "the reproduction and development of the mineral resource base, as well as the exploration and production of solid minerals in the Arctic zone, including in the exclusive economic zone of the Russian Federation and on the continental shelf," to

the objectives of the first stage of its implementation for 2020–2024. This provides an opportunity to mitigate these imbalances, but, in turn, also requires corresponding adjustments to the action plan for implementing the Arctic Zone Development Strategy, which, in its current version, is clearly insufficient to address this issue. Thus, the focus of state policy on the development of Russian Arctic territories and the improvement of subsoil use legislation are creating a favorable environment for the development of entrepreneurial activity in the mineral extraction and processing industry. However, its practical implementation requires further work to specify the introduced provisions, adjust related legislative acts and expand the range of their impact on other types of mineral resources that are of strategic importance for the development of high-tech sectors of the national economy and moving away from import dependence.

Economic factors(E) The current challenges regarding the implementation of the integrated processing approach for mineral resources include: high processing and transportation costs; uncertainty in demand for additionally extracted valuable components; and a lack of necessary production capacity. Finding customers willing to purchase small volumes of extracted raw materials is a challenging task, given the remoteness of the Arctic regions and the limited market of local economic entities, the number of which in the Arctic Zone of the Russian Federation is decreasing every year (Table 8).

Table 8. Comparison of the rates of change in the number of economic entities, %

Region	2011	2012	2013	2014	2015	2018	2020	2021	2022	2023	2024	Average for the period
Republic of Karelia	103	104	96.9	101.2	103.3	100.1	93.7	91	95.3	94.9	92.5	97.8
Arkhangelsk region, including the Nenets Autonomous Okrug	98.6	99.8	102.6	96.3	101.7	92.7	95.3	95.5	94.9	94.7	94.2	96.9
Russian Federation	100.9	100.4	99.1	100.9	103.2	94.5	95.7	92.4	90.8	91.9	95.1	96.8
Yamalo-Nenets autonomous district	94.8	100.2	102.2	98.2	103.2	101.2	91.4	91.5	92.8	93.8	94.5	96.7
Komi Republic	96.7	93.9	102.5	97.6	101.9	97.6	92.8	95	90.3	92.9	90.9	95.6
Murmansk region	93.3	99.2	101.6	101.1	103.5	84	96.2	94.2	85.9	95.8	97.4	95.7

When considering the most common business management concepts for the integrated processing of mineral resources, it should also be noted that a key role is still assigned to the existing business, as the primary user of the deposit. Decisions by existing businesses are based primarily on economic considerations: ensuring the profitability of a new activity and maintaining the current level of profitability and productivity of existing production. Implementing these considerations in Arctic conditions is impossible without government support.

In view of this, the measures and objectives set forth in the Arctic Zone Development Strategy until 2035 and Federal Law No. 193-FZ of July 13, 2020, "On State Support for Entrepreneurial Activity in the Arctic Zone of the Russian Federation," provide a foundation conducive to their implementation. At the same time, with regard to subsoil use, the established mechanisms for interaction between economic entities of the SSR and the SCF need to be expanded to cover other production processes related to the processing of extracted mineral raw materials, due to their capital intensity being no less than geological exploration and deposit development, and the need to attract investment in this activity. Synchronizing such measures across Russian Arctic regions has the potential to both stimulate entrepreneurial activity in these regions and make integrated processing projects cost-effective, increasing the practical interest of existing subsoil users. The greatest concern for measures aimed at increasing entrepreneurial activity in general and in terms of the integrated processing of mineral resources are caused by social factors (S), caused by a shortage of labor resources in the areas

where investment projects of Arctic zone residents will be implemented. The key negative trend for all regions of the Arctic Zone of the Russian Federation is the decline in the working-age population and its migration outflow (Table 9). Over 20 years, the permanent population of the northern territories has decreased by 1.1 million (from 10.9 million people in 2001 to 9.8 million people in 2024). Negative trends in the area of migration population growth persist. Thus, the migration population growth was -51.1, -30 and -10.7 thousand people in 2014, 2020 and 2024, respectively.

Achieving the economic feasibility of integrated mineral resource processing is largely possible through the search for and development of effective technological solutions. Therefore, technological factors (T) continue to play a key role in ensuring waste recycling and the integration of the entire range of valuable components contained in ore into processing. A combined processing scheme necessitates not only the alignment of processes and functions within the economic entity but also the development of intersectoral collaboration.

Table 9. Population dynamics by regions of the Arctic Zone of the Russian Federation in 2010–2024, thousand people.

Regions	2010	2011	2012	2013	2014	2015	2019	2020	2021	2022	2023	2024
Completely Arctic regions												
Chukotka Autonomous Okrug	51	51	51	51	51	50	50	50	50	50.3	49.5	50
Nenets Autonomous Okrug	42.1	42.1	41.8	41.7	41.6	41.4	41.3	41.2	41.1	44.1	44.4	44.5
Yamalo-Nenets autonomous district	525	537	542	540	540	534	536	538	541	544.4	547	552.1
Murmansk region	794	788	780	771	766	762	757	754	748	741.4	732.9	724.5
Partially Arctic regions												
Krasnoyarsk Krai	2830	2833	2842	2849	2855	2862	2870	2875	2875	2870	2861	2852
Republic of Karelia	642.6	639.7	636.9	634.4	632.5	629.9	627.1	622.5	618	614.1	609.1	603.1
Komi Republic	899.2	889.8	880.7	872	864.5	856.8	850.5	840.9	830.2	820.5	813.6	803.5
Republic of Sakha (Yakutia)	958	956	956	955	957	960	963	964	967	972	982	992.1
Arkhangelsk region	1224.9	1182.8	1202.3	1191.8	1183.3	1174.1	1130.2	1155	1144.1	1092.4	1082.7	1069.8
Russian Federation	142,865	143,056	143,347	143,667	146,267	146,545	146,804	146,880	146,781	146,749	146,459	175,864
Total for the Arctic Zone of the Russian Federation	5094.7	5075	5048.9	5015.2	4994.3	4966.8	4949.3	4924.4	4898.3	3786.8	3778.5	3769.8
Share in the all-Russian indicator, %	3.57	3.55	3.52	3.49	3.41	3.39	3.37	3.35	3.34	2.58	2.58	2.14

Since, when developing a "deposit assigned to a particular industry based on its main mineral, the funds released are intended for the production of that particular mineral—the industry's product. The rest is waste. But when it comes to regions such as the Krivoy Rog Basin, the Kola Peninsula, the Urals, and

the Kursk Magnetic Anomaly, the implementation of waste-free technology within a single mining and processing plant is hardly possible. Rational nature management requires not only the disposal of the majority of waste; it also implies the organization of an industrial circulation of substances that will not disturb the ecological balance. Consequently, it is necessary to obtain products for various industries" [Vilkul et al., 2013]. One such industry is mechanical engineering. Russia's high dependence on imports for mining machinery and equipment increases the risks of implementing both Strategies, including the development of the Arctic Zone of the Russian Federation and the mineral resource base as a whole, in the event of a deterioration in geopolitical conditions. Since the 1990s. In search of the most effective solutions, companies resorted to a combination of domestic and foreign technologies: this included laboratory, quarry, mine, conveyor, and auxiliary equipment, digital and automation systems, and software. Due to the complexity and scale of the mining industry, not all equipment can be replaced quickly and without compromising efficiency.

This primarily concerns complex equipment: for example, according to estimates by the Non-Profit Partnership "Mining Industrialists of Russia," in the mining machinery sector, it will soon be difficult to find comparable imports in the required volumes for underground drilling machines, load-haul trucks, compact dump trucks, and open-pit mining equipment. This risk can only be mitigated by developing domestic production and providing it with the necessary mineral raw materials, as well as by encouraging research and development through public-private partnerships and developing a lending system for such projects.

A primary (theoretical) assessment of the identified factors, as perceived by economic agents, was conducted through in-depth structured interviews with business and government experts, the main market participants whose entrepreneurial activity predominates in the Arctic Zone of the Russian Federation. The business expert interviewed was the head of a major mining company in the Murmansk Region, responsible for ensuring integrated processing and developing mining operations at the company. The government expert interviewed was the head of the municipal administration where the major mining company operates. The comparison of business and government opinions on integrated processing of mineral resources is shown in Figure 9, and the assessment of barriers is shown in Figure 10.

It has been established that both business and the government recognize the importance and potential of implementing integrated processing of mineral resources, provided that this activity receives special support from the government and that efforts are made by all market participants. Business, unlike the government, sees not only the advantages of implementing this concept, but also its disadvantages.

Figure 9. Comparison of opinions on the integrated processing of mineral resources among business and government representatives.

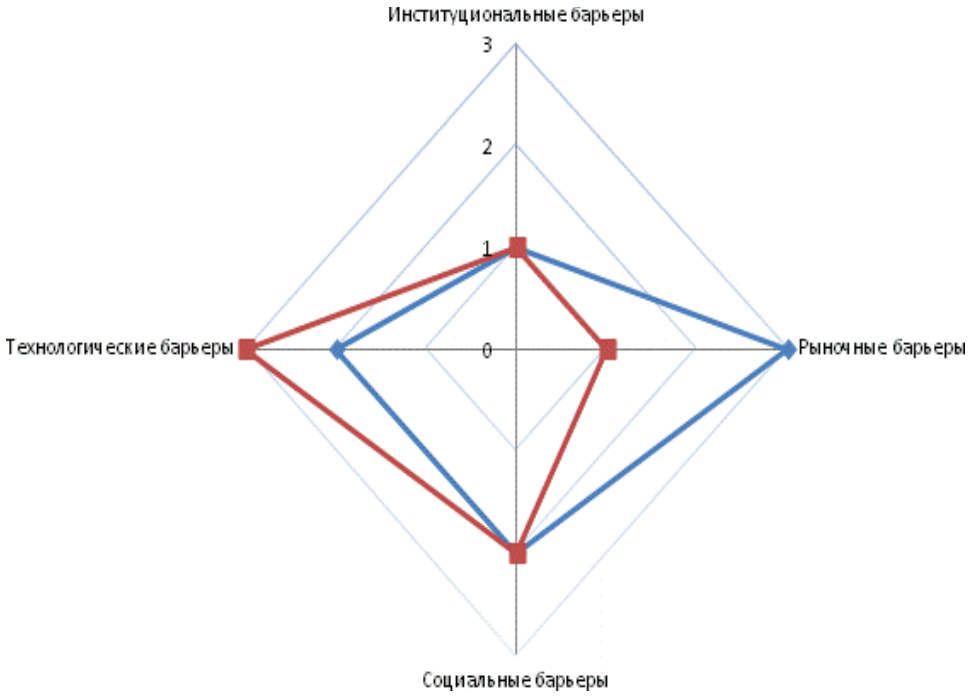


Figure 10. Comparison of opinions on barriers to the implementation of integrated processing of mineral resources.

The risks identified by businesses primarily included "demand risk," "profitability risk," and "competition risk." Technological risk is also assessed differently by businesses and the government, with the former assigning it less significance and defining it as entirely solvable.

It is noteworthy that the "institutional risk" associated with the regulatory framework for the approach to integrated processing of mineral raw materials and waste recycling, which is widely covered in existing scientific research as a key issue complicating the solution of the issue in the Russian Federation, was not identified as significant by either business or the government.

"Social barriers" were noted by businesses and the government as significant, but manageable and mitigated by diversifying production based on the integrated processing of mineral resources through the creation of additional jobs and the implementation of corporate and government programs to attract and retain personnel.

The interviews allowed for a deeper understanding of each of the PEST analysis factors and the identification of new aspects relevant to economic entities in terms of their readiness and resistance to the practical implementation of the integrated mineral resource processing concept. To account for and systematize all possible factors determining the readiness and resistance of market participants to implement the integrated mineral resource processing concept (hereinafter, IMPC), and to conduct a more in-depth and expanded assessment using content analysis as the second stage of the study, a review of scientific publications on the topic of integrated mineral resource processing was conducted.

As a result, 20 factors were identified that scientists and researchers emphasize when considering the problem of integrated processing of mineral resources.

The first and most frequently cited factor is mineral reserves. It was mentioned in some way or another in all of the publications reviewed, and to a large extent (67%) it had a positive emotional connotation, driven by Russia's significant endowment with mineral resources of both natural and man-made origin. Conditions that facilitated the implementation of the CPMS included: deterioration in mining and geological conditions and the quality of deposits involved in development; and a reduction in the volume of geological exploration. Negative assessments of this factor, which hinders the implementation of the CPMS, included the deterioration over time of the qualitative and quantitative composition of previously formed, mature waste, and changes in the physical and mechanical properties of rocks.

Publications also highlight the potential for developed processing technologies, alongside mineral resource reserves. This is mentioned as a potential opportunity in 33% of publications and is characterized by the presence of significant scientific groundwork and accumulated experience in developed technologies for the comprehensive and in-depth processing of mineral resources. However, in other cases, the technological factor is viewed more

negatively due to the lack of effective processing technologies ready for large-scale application and the need for further research. One of the key requirements in this area is the need to create a unified information space for accounting for mineral resource reserves, both natural and man-made, to obtain reliable mineralogical information that should be accessible to research institutes and manufacturing organizations across various departments.

The availability of required production capacity is crucial for the implementation of the integrated processing chain. This includes the availability of existing processing assets, the number of economic entities owning them, and their category (small, medium, or large businesses), as well as the equipment used in the processing. The publications reviewed positively noted that Russia has significant potential to create a complete production chain; however, interregional cooperation has not been sufficiently widespread, resulting in underutilization of production capacity at most facilities. It is noted that the organization of integrated processing chain production is possible within a single enterprise without the need to separate this activity into a specialized production facility. However, there are limitations regarding the adequacy of in-house material and technical resources, reflected in the lack of R&D departments and the efficiency of existing equipment in terms of productivity and environmental safety, as well as its wear and tear and the need for modernization. The latter requires economic entities to make significant investments in modernization, which is another factor in implementing the integrated processing chain identified in the analysis. Moreover, investments are required not only to improve the material and technical base, but also to resolve the issue of staffing.

The success of the implementation of the CPMS, like the progress of any sector of material production, is directly dependent on the quality of personnel. The personnel factor in the publications reviewed positively characterizes the existing Russian system of training higher and secondary education personnel for the mining industry, which has preserved the principles of traditional Russian education and specialized training as the level of higher professional education. However, the need for further improvement is also noted to align it with current business needs and maintain a proactive approach. Certain areas of personnel training, such as geology and mineralogy, require strengthening, as does the implementation of the concept of continuous education for mining engineers in collaboration with the educational, scientific, and business communities.

The fifth factor in the publications reviewed was government regulation (the state of the legal framework). This factor was largely (75%) viewed negatively in the publications reviewed, citing the imperfections and inadequacy of the current regulatory framework in Russia. This was fully reflected in the content of the first stage of implementation of the Strategy for the Development of the Mineral Resources Complex of Russia until 2035, as one of its key objectives. A constraining effect was also characterized by departmental disunity in waste management (Rosprirodnadzor and Rosnedra), in matters of establishing property rights, and the lack of a unified accounting system. Opportunities were created by the emergence of new and updated legislative regulations, which strengthen subsoil users' responsibilities for waste management, as well as the need to develop new approaches to state management of deposit operations in general. The sixth factor, administrative barriers, was a derivative of the "government regulation (legal framework)" factor. It was clearly viewed as negative, as it complicates the activities of subsoil users in the use (recycling) and disposal of the waste they generate; access to accumulated man-made waste by organizations, including small mining businesses, is limited; there is a need to license waste management activities; and the principle of "developing large deposits" applies to the development of man-made waste. The latter aspects were also identified as separate factors—the factor of patents, licenses for operations, and the factor of permits for the implementation of the type of activity. The marketing component of the CPMS is directly linked to the demand factor. In the reviewed publications, it is encountered in terms of justifying the relevance of the CPMS in the analysis of the application areas of extracted valuable components. As an opportunity for the implementation of the CPMS, the demand factor is determined by the development of areas of activity where valuable components of mineral raw materials, the content of which in the mined ore is generally insignificant, are in demand. At the same time, their diversity also becomes a deterrent, since the demand for them is often differentiated and small in volume.

The profitability of implementing a multi-component mineral resource complex (MRC) is determined by the price of the extracted valuable components. The key scientific question addressed in the publications is the definition of a pricing methodology for MRC, including the justification of the price of each valuable element that makes up a multi-component mineral resource and the various products of its complex processing at different stages of production, including recycled mining waste. Having a scientific foundation for the pricing methodology is a positive aspect of this factor. The constraining nature of the price factor is reflected in the correlation between the dynamics of global prices for the final products of the mineral resource complex and the traditional primary processing technologies used, necessitating government regulation of this issue through cost subsidies and a corresponding export policy. In examining the MRC issue, the

authors also consider the energy factor. The feasibility of organizing a MRC is justified by the sufficient energy supply of the Russian national economy. In a market economy, maintaining the competitiveness and profitability of companies requires a constant search for new technological solutions that improve production energy efficiency due to rising energy prices. Russia currently has effective energy-saving technologies for the comprehensive and deep processing of refractory ores with complex compositions and man-made mineral raw materials, enabling the production of high-quality finished products that are competitive in the global market. Besides energy, the main production costs in mineral processing are related to the purchase of chemical reagents used to obtain concentrates and isolate marketable products. Therefore, the component selection factor was the next key consideration. The positive impact of this factor, which determines the feasibility of implementing the CPMS, is due to scientific advances in the development of new, efficient processes. However, it is noted that the reagents used have several drawbacks, including their environmental hazards and economic inefficiency. Therefore, the search for and development of new reagents remains a pressing scientific challenge. Furthermore, this factor can be attributed to resistance due to the shortage of domestically produced products noted in publications and the insufficient technical base for their production in Russia. The authors of the publications identified the need for government support as a mechanism for mitigating all resistance factors. In terms of government incentives for the CPMS, the issue of tax regulation of this activity is most frequently raised in publications. Researchers argue that increasing the economic efficiency of the CPMS requires eliminating the causes and conditions contributing to the unlawful formation of the tax base and determination of taxable objects for organizations implementing the CPM. However, so far, this condition in the publications reviewed acts more as a deterrent due to its impracticability in Russia. The flat scale of the current mineral extraction tax does not allow for differentiation in its collection depending on the stage of development, mining and geological conditions, degree of depletion, and location of the deposit, which creates an unequal playing field for mining organizations. Extraction of minerals with significant operating costs becomes impractical for subsoil users (a negative indicator of the economic efficiency of the field development project), and the state (the owner of the subsoil) experiences an increasing number of unprofitable deposits. Other government support measures include preferences related to cost subsidies, stimulating demand for new products, and price regulation. The insufficient implementation of these mechanisms in Russia, compared to other countries, such as China.

In terms of rare earth elements, this is considered a factor hindering the implementation of the CPMS. The development of the CPMS also depends on the level of interaction between economic entities in the industry. In the publications reviewed, this condition is reflected in the factors of competition and the availability of necessary suppliers (contractors) and partners. Competition is viewed as a factor hindering imports, which fully satisfy domestic demand for valuable components that are by-products in the production of the main product at Russian facilities and are often inferior in quality to imported ones. The lack of economic entities willing to act as suppliers and the low level of cooperation and interaction between companies as partners to create a unified production chain are also negatively assessed in the publications where they are mentioned, which classifies these factors as factors of resistance.

In order to optimize the work on further analysis and evaluation of the identified factors, and also due to the fact that their list is not exhaustive, the listed factors were systematized according to their generalizing feature into five main groups.

The first group "Resource component" will include factors such as the availability of mineral reserves, the availability of production capacity, the number of personnel and their qualifications, investment opportunities, the sufficiency of components for production (additives, reagents, materials, components, etc.) and energy security.

The second group of factors, "Technological component," includes the developed potential technology for processing mineral raw materials, as well as patents and licenses for carrying out activities.

The third group "Institutional environment" is represented by factors that determine the legality of an activity, namely, the availability of permits to carry out a type of activity, the level of administrative barriers and state regulation of this activity from the point of view of the state of the legal field.

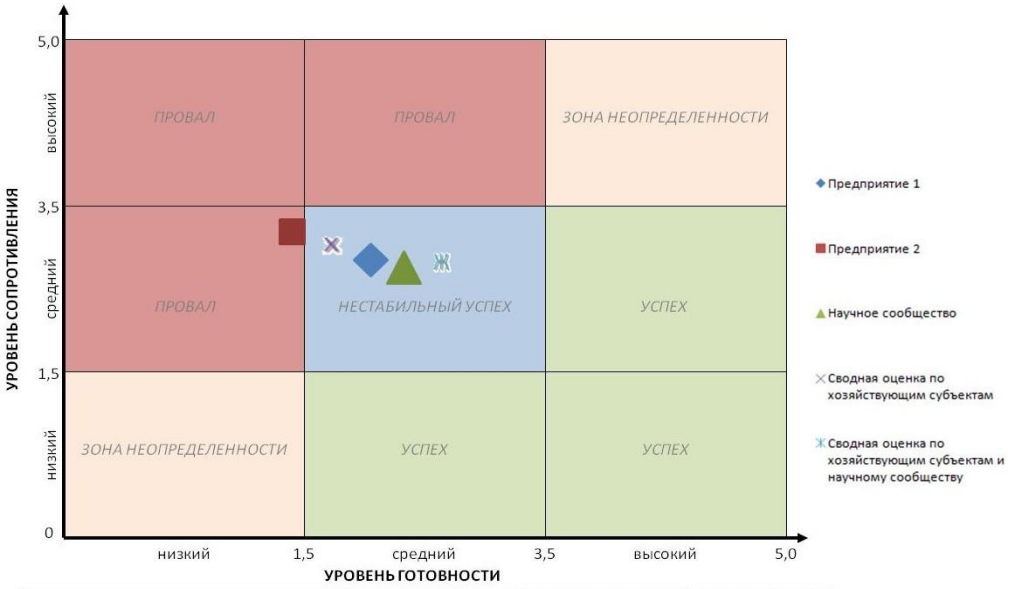
Market factors are included in the fourth group, "Market Component," and include the level of prices, demand, and competition in the market, as well as entrepreneurial activity in the market in the form of the availability of necessary suppliers and contractors that must be attracted to organize activities for the integrated processing of mineral resources.

The fifth group of factors is designated as "Supporting Environment" and is represented by measures to support the type of activity from the state, as well as the development of partnerships and the willingness of economic entities to cooperate in implementing the CPMS.

The resulting classification of factors served as the basis for developing a questionnaire, which was used to interview representatives of the business and scientific communities operating in the Arctic Zone of the Russian Federation using expert assessments. The Murmansk Region was chosen as the study region, following on from a previous study. Expert

assessments were obtained from two major mining companies in the Murmansk Region and from representatives of the scientific community. A key condition for the survey was. The survey was conducted anonymously, so the results of the assessments obtained are presented in a generalized form. The collected data was processed using a method for determining the probability of successful change implementation. This method was chosen because it is applicable to any project, regardless of its scale, and can be considered in relation to a specific project or enterprise, as well as changes at the economic level as a whole, based on a wide range of indicators, allowing for a comprehensive assessment of the upcoming changes.

Based on the results of the expert survey and the processing of the obtained assessments, the following summary assessments of the level of readiness and resistance of the regional economic system of the Murmansk region to the transition to the implementation of the concept of integrated processing of mineral resources were obtained (Appendices B and G, respectively).

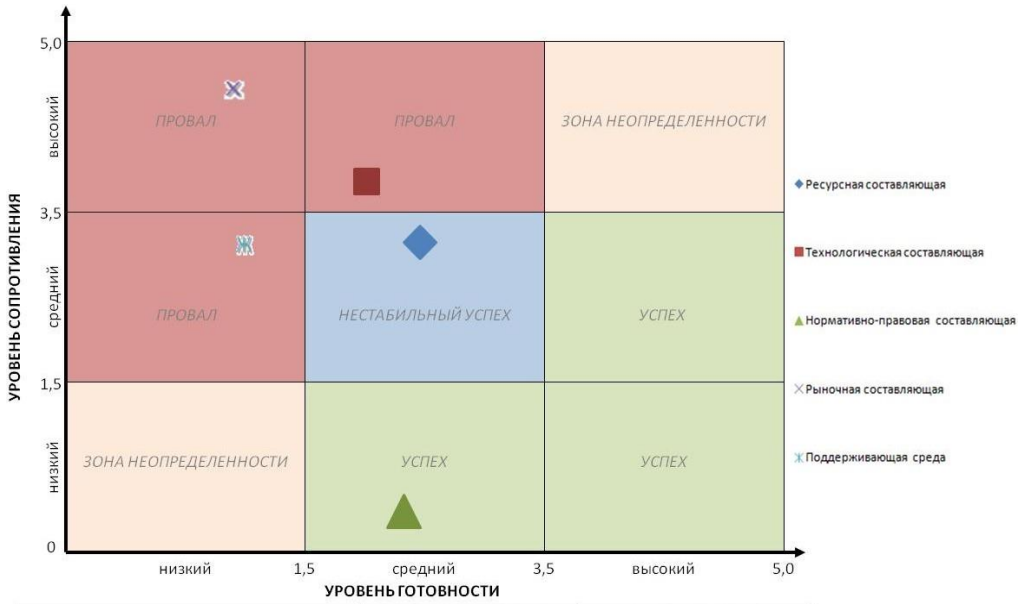


	Уровень сопротивления	Уровень готовности
Предприятие 1	3,02	2,15
Предприятие 2	3,38	1,48
Научное сообщество	2,51	2,40
Сводная оценка по хозяйствующим субъектам	3,20	1,81
Сводная оценка по хозяйствующим субъектам и научному сообществу	2,97	2,01

Figure 11. Positioning matrix of the regional economic system of the Murmansk region in relation to the success of the transition to the implementation of the concept of integrated processing of mineral resources.

After assessing the readiness and resistance of the Murmansk region's regional economic system to change, we positioned the region's economic entities and the regional economic system as a whole (with and without consideration of the scientific community's opinion) relative to the success of the transition to the integrated processing of mineral resources. The resulting positioning matrix relative to the success of the changes is shown in Figure 11.

During change management, it's important to assess the level of resistance to each specific change. Therefore, the level of readiness and resistance was also assessed for each identified group of factors, as the sum of its constituent indicators. The positioning of each group of factors relative to the change implementation success matrix is shown in Figure 12.



	Уровень сопротивления	Уровень готовности
Ресурсная составляющая	3,34	2,41
Технологическая составляющая	3,70	1,88
Нормативно-правовая составляющая	1,44	2,16
Рыночная составляющая	4,35	1,25
Поддерживающая среда	3,13	1,18

Figure 12. Matrix of positioning groups of transition factors for the implementation of the concept of integrated processing of mineral resources according to estimates of economic entities.

Thus, as a result of collecting and processing the received expert opinions, the readiness assessment of the regional economic system of the Murmansk region amounted to 1.81 points (out of a possible 5) with a resistance level of 3.20 points (out of 5, where 5 is the highest level of resistance), which can be characterized as a level of "unstable success" in the positioning of the regional economic system. This means that the regional economic system of the Murmansk region has a fairly high level of resistance and an average value of readiness for changes associated with the transition to the implementation of the concept of integrated processing of mineral resources. A separate collection of expert opinions from the scientific community on the transition to the implementation of the concept of integrated processing of mineral resources was conducted. The obtained assessments are also positioned in the "unstable success" zone, with a readiness level of 2.40 points (out of a possible 5) and a resistance assessment of 2.51 (out of 5, where 5 is the highest level of resistance).

It is necessary to reduce resistance to change and, where possible, increase the willingness of regional economic entities to embrace such changes. It was noted that the range of economic entities' assessments of their readiness varied widely, ranging from 1.48 (out of a possible 5) to 2.15 (out of a possible 5), while the level of resistance was assessed almost uniformly—from 3.02 to 3.38 (out of 5, with 5 representing the highest level of resistance). Consequently, some enterprises find themselves in a "failure zone" when deciding to implement the integrated mineral resource processing concept, meaning the economic entity is unprepared to implement the changes and faces significant risks. Other enterprises are in a "fluctuating success zone," meaning it is difficult to definitively assess the feasibility and success of the changes. The differences in assessments between economic entities are due to the varying experience of the surveyed economic entities in this area and the availability of proven processing technologies.

An in-depth analysis of the situation to determine the conditions under which a decision could be made to transition to the implementation of the concept of integrated processing of mineral resources by economic entities was conducted using a selected set of five groups of indicators, which were used in the expert survey. These indicator groups were also analyzed using the positioning matrix method relative to the success of the undertaken changes (Table 10). As a result, the "Regulatory component" factor group fell into the "success" zone, with a readiness score of 2.16 (out of 5 possible) and a resistance level score of 1.44 (out of 5, where 5 is the highest level of resistance). Expert comments indicated the relative transparency and clarity of the legal framework, and the absence of administrative barriers to the implementation of this activity. The "Resource component" factor group is in the "unstable success" zone, with a readiness level score of 2.95 and a resistance level score of 3.34. According to the experts, the lowest risk factor scores from this set of

indicators were characterized by insufficient (absent) existing production capacities and insufficient personnel (both in number and qualifications). The three remaining factor groups were classified as "failure" zones: "Supporting Environment" (readiness level - 1.18 points, resistance level - 3.13 points); "Market Component" (readiness level - 1.25 points, resistance level - 4.35 points); "Technological Component" (readiness level - 1.88 points, resistance level - 3.70 points). The following were identified as key risk indicators:

- lack of regular customers with significant order volumes;
- the lack of interested partner companies willing to integrate into the existing technological process to implement processes prior to extraction and more in-depth complex processing of mineral resources;
- low competitive advantages in terms of extracted valuable components compared to analogues on the market;
- lack of subsidies for costs from the state, especially in terms of conducting a feasibility study for the integrated processing of mineral resources;
- economic the inappropriateness of the existing technology for industrial development due to the above-mentioned risks.

Table 10. Assessment of groups of factors influencing the implementation of changes in the transition to the concept of integrated processing of mineral resources, according to the level of their readiness and resistance

Group of factors	Summary assessment			
	by economic entities of the region		for economic entities and the scientific community	
	resistance level	level of readiness	resistance level	level of readiness
Resource component	3.34	2.95	3.06	2.41
Technological component	3.70	1.88	3.56	1.60
Regulatory component	1.44	2.16	1.47	2.87
Market component	4.35	1.25	4.07	1.83
Supportive environment	3.13	1.18	3.06	1.39

The identified risk indicators and readiness of economic entities and the regional economic system as a whole for the transition to the KPMS concept form the basis for developing proposals and recommendations for subsequent stages of implementing the Strategy for the Development of the Mineral Resource Base of the Russian Federation to 2035, which will enable the formulation of a new plan of activities planned for implementation from 2025 to 2035. The transition to a new paradigm of state environmental regulation since 2014, based on the principles of best available technologies and focusing on the environmental and technological aspects of mining and processing waste management, has overshadowed its economic and property aspects. At the same time, the resource potential of accumulated waste from past activities and its negative impact on the environment, in the absence of institutional conditions stimulating the effective use of waste in recycling, represented a problematic area of environmental management, which was reflected in the Strategy for the Development of the Mineral Resource Base of the Russian Federation to 2035. The objective of the Strategy is to create conditions for a sustainable supply of mineral resources for socioeconomic development and to maintain an adequate level of economic and energy security for the Russian Federation. Its implementation was intended to consolidate the efforts of legislative and executive bodies of state power, authorities of the constituent entities of the Russian Federation, and the scientific, scientific-educational, and business communities (including small and medium-sized businesses) to create a favorable legal, investment, and business climate and ensure the necessary technological and human resources. The first stage of the strategy (2018–2024) envisaged improving the key legal and economic mechanisms that would facilitate the growth of the investment attractiveness of Russian subsoil resources, as well as optimizing work areas funded by the federal budget in accordance with the provisions of the Strategy. The results of this first stage were to include the necessary program and project documents ensuring the concentration of financial resources, technological, and human resources potential to achieve the development indicators of the Russian Federation's mineral resource base. The second stage (2025–2035) envisaged the implementation of a full range of works to achieve the goals and objectives of the Strategy, taking into account its updating.

As part of the implementation of the first stage of

the Strategy, significant work was carried out to improve the legal framework. For example, in 2024, Federal Law No. 123-FZ was adopted, introducing the most extensive amendments to the Law "On Subsoil" in the last 30 years. Nine Russian Government resolutions, two orders of the Ministry of Natural Resources and Environment, and 22 joint orders of the Ministry of Natural Resources and Environment and the Federal Agency for Subsoil Use were approved to implement the law.

The changes implemented since 2015 have provided a significant boost to the development of geological exploration (Figure 13). However, the strategy's approved path to achieving the goal of sustainable mineral resource supply by increasing the investment attractiveness of geological exploration at all stages, improving the quality of forecasting and prospecting for new deposits, and enhancing the efficiency of developing known deposits, including undeveloped ones, through the implementation of modern technologies for processing, enrichment, and integrated mineral extraction is not being fully implemented or balanced.

Dynamics of financing geological exploration work for solid mineral resources from all sources of financing in 2017–2021 and forecast for 2022, billion rubles.	**Dynamics of federal budget expenditures on geological exploration of groundwater in 2016–2021. and plans for 2022, million rubles.**	**Dynamics of financing of geological exploration for oil and gas in 2013–2021 and plans for 2022, billion rubles.**

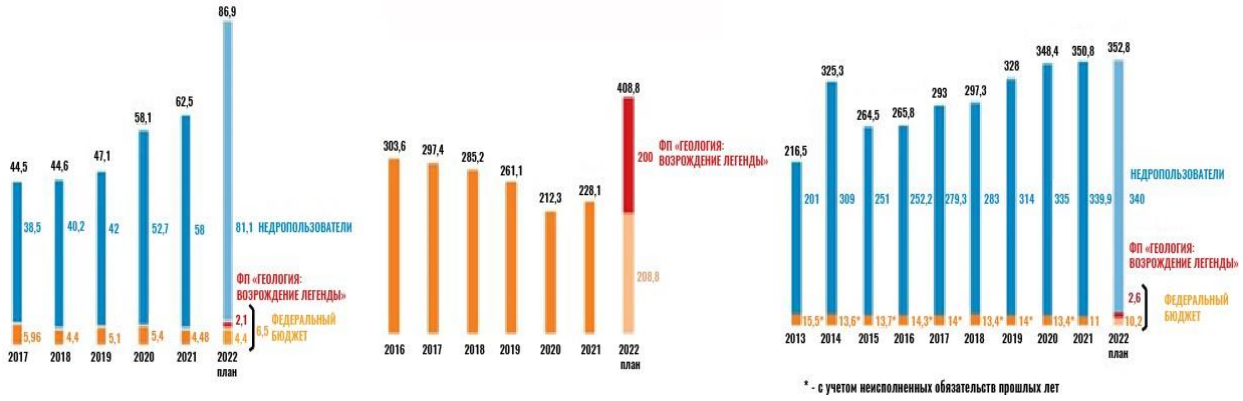


Figure 13. Dynamics of financing for geological exploration of solid minerals, groundwater, and oil from all sources of financing in 2018–2024 and forecast for 2026, billion rubles.

Currently, the Strategy's implementation emphasizes extensive methods, that is, improving the quality of forecasting and prospecting for new deposits. This is evidenced by its key performance indicators, namely, the increase in reserves of key minerals and the volume of extra-budgetary investments in geological exploration, which are being achieved quite successfully (Table 11). However, the least addressed aspect is the area related to improving the efficiency of developing known deposits, including undeveloped ones, through the implementation of modern technologies for processing, enrichment, and integrated extraction of minerals. The consequences of this imbalance include: the continued accumulation of mining waste; the increase in the volume of man-made deposits; and the involvement of large areas of land in production processes (Table 12).

Table 11. Implementation of the Strategy for the Development of the Mineral Resource Base of the Russian Federation until 2035

Indicator	2018	2019	2020	2021	2022	2023	2024
Number of licenses issued on an application basis, units.	256	427	404	797	1244	1636	1685
Investment value of geological exploration projects carried out on a “declarative” basis, billion rubles.	9.1	17.8	25.5	23.3	38.8	65	83.4

Furthermore, the need for a near-term revision of subsoil use policy from extensive to intensive development methods, including through the integration of accumulated man-made deposits, is supported by data on the number of discovered deposits (Table 13), as well as the results of a critical analysis of the strategy by researchers. From a methodological perspective, the approved Strategy has two shortcomings:

1) there is no mechanism (methodology) for implementing generally correctly formulated ideas, goals and objectives for choosing a strategy for the development of mineral resources;

2) The main focus is on the geological study of the subsoil and the assessment of the current state of the provision of explored reserves of various types of mineral raw materials, but without taking into account the geological, technological, economic, natural and socio-economic conditions for the integrated development of deposits in the raw material regions of Russia.

Table 12. Dynamics of formation, use and accumulation of production and consumption waste

Indicator	2022	2023	2024
Mining			
Generation of production and consumption waste by type of activity: mining, thousand tons	6,850,485.4	7,257,022.1	6,367,335.6
Recycling and disposal of production and consumption waste by type of activity: mining, thousand tons	3,585,213.5	3,561,595.4	2,970,827.4
The ratio of waste generation and disposal by type of activity: mining, %	52.3	49.1	46.7
Processing of minerals			
Generation of production and consumption waste by type of activity processing of minerals, thousand tons	204,190.6	214,818.7	201,332.6
Recycling and disposal of production and consumption waste by type of activity: mineral processing, thousand tons	103,395.7	113,678.3	99,668.5
The ratio of waste generation and disposal by type of activity: mineral processing, %	50.6	52.9	49.5

Dynamics of the number of deposits registered with the state

Indicator	2022	2023	2024
Number of deposits, units	59	49	37

An analysis of the Strategy's implementation conducted by the Accounts Chamber of the Russian Federation in 2020 also confirmed that the results obtained do not allow for a full assessment of its effectiveness. One of the recommended actions in the report is the recycling of mining and processing waste and the implementation of cost-effective technologies for the enrichment of low-quality mineral raw materials through the development of a targeted project for geological exploration and rational subsoil use.

Legislation is needed to establish incentives for organizing mining production that eliminate waste generation and utilize intermediate products in a closed-loop process for both primary and secondary production. At the same time, legislative measures alone will not be enough: it is necessary to increase the interest of existing economic entities—subsoil users—in this type of activity. The historical practice of single- and dual-component mining in Russia, despite the significant wealth of mineral deposits, has been the traditional operating method for mining companies. The transition to the concept of integrated mineral processing is a change for which regional economic systems, and in particular the economic entities within them, must be prepared. The larger the organization and the greater the resistance of its subsystems to the innovations being introduced, the more difficult it is to implement change. An organization's size is partly related to its stability, and partly to its longevity. Both factors are, to some extent, linked to the reluctance of subsystems to improve due to their greater or lesser satisfaction with the status quo. In reviewing these provisions regarding the adopted approach to conducting activities in the mineral extraction and processing industry in the Russian Federation, we can state the need to carry out significant preliminary work before implementing such a change for its successful implementation.

The identified assumptions were confirmed

during the study of the assessment of the regional economic system's readiness to implement changes associated with the transition to the implementation of the concept of integrated processing of mineral resources.

The regional economic system of the Murmansk region exhibits a relatively high level of resistance and a moderate level of readiness for changes associated with the transition to the implementation of the concept of integrated processing of mineral resources. Therefore, it is necessary to reduce resistance to change and, where possible, increase the readiness of the region's economic entities to accept such changes. For the Murmansk region, the resistance factors are the "market component," "supporting environment," and "technological component" factors, while the "resource component" and "regulatory component" factors ensure readiness for the transition.

Taking into account the obtained results of the study, namely: a) for the Murmansk region, as a region fully included in the Arctic Zone of the Russian Federation, the intensification of entrepreneurial activity is possible through internal outsourcing, the creation of a technology park with the participation of the state, as well as the establishment of new business structures on the basis of PPP; b) the most promising for the Khibiny deposits will be business models A "Involvement of economic entities in the production processes" (gaining access to deposits for organizing production and primary processing there) and B "Involvement of an economic entity in the processing processes" (creation of additional production stages to the current technological process of producing concentrates of JSC Apatit and gaining access to process waste, which serves as raw materials for the next stage of production), then the solution to the issue of transition to the implementation of the concept of integrated processing of mineral resources at the preparatory stage should be the fulfillment of a number of general conditions that can have practical value for all resource regions of Russia with a similar profile in terms of the level and type of entrepreneurial activity, as well as specific ones, that is, characteristic only of the Murmansk region.

The general conditions will include the following.

First, this is a condition for ensuring the necessary level of demand. It is assumed that, initially, this demand should take the form of government procurement, which would stimulate entrepreneurial activity among economic entities toward advanced processing, either independently or through partnerships or outsourcing, primarily for strategic mineral raw materials that are at risk of import dependence and necessary for the development of high-tech industries in the national economy.

Second The development of marketing in the mining industry is becoming a requirement, not only for the potential use of raw materials as components for the production of certain products, but also from a geological perspective. This allows, at the time of developing a feasibility study for new deposits, to assess the current potential for extracting the same useful component through the deployment of a comprehensive processing concept at existing facilities and to compare the resulting economic, environmental, and social impacts for the final decision. This requirement requires the existence of a corresponding unified information system for accounting for reserves at developed and potential deposits, supplemented by interconnected databases of mineral resource consumers, their demand volumes, and data on other producers, both existing and potential. Such analysis should be a mandatory requirement for any new mining project, and its reliability should be monitored by government agencies. The third condition (from a logistical perspective) is the creation of a logistical distribution system through the establishment of a state-owned management company that issues government contracts, collects consumer orders on the market, and redistributes completed government contracts for the integrated processing of mineral resources in both small and large batches. This company also searches for potential partners who could integrate into existing technological processes on an outsourcing basis. To this end, appropriate legal conditions must be created based on the extension of the practice of working under SSR and SUF contracts from hydrocarbons to other types of mineral resources that are primarily import-dependent or strategically important for the development of high-tech consumer industries. The scope of such agreements must be adjusted to the goal of ensuring the integrated processing of mineral resources and expanded from geological exploration and development to other technological stages of mineral extraction and processing.

Furthermore, an important condition of the first stage will be government support for subsidizing costs associated with conducting feasibility studies, a high-risk and costly activity for economic entities. This can be implemented through a grant system for the scientific community, based on the analysis of corporate orders from economic entities in the industry. In other words, a grant is issued for a specific order on a research and development or experimental design topic in which economic entities in the industry express interest.

In addition to those listed above, special conditions for the development of small and medium-sized businesses will be introduced for the Murmansk Region. At the regional economic level, this will allow for the creation of an optimal number of economic entities in service, auxiliary, and related processes related to mining and processing production through the development of intra-corporate entrepreneurship. This proposal is based on the established predominant entrepreneurial activity of businesses and will also

address the labor shortage associated with the region's rapid population decline in recent years. This latter issue requires particularly careful study to identify solutions for changing migration policy and developing proposals for managing shift work in the Arctic.

Thus, the proposed recommendations may form the basis for developing an action plan for the period 2024–2030 for the implementation of the Strategy for the Development of the Mineral Resource Base of the Russian Federation until 2035, and the proposed approach, based on an assessment of the PA and determining the readiness of regional economic systems to transition to a new operating concept, may become the methodological basis for adjusting the Strategy, allowing for consideration of the specific features of the regional economies, their individual sectors, and development plans for systemically important enterprises.

Conclusion

The article explores the challenges and prospects for developing conditions for the integrated use of raw materials in the Russian Arctic regions. It confirms that implementing the integrated use concept requires intensifying the entrepreneurial activity of economic entities in the mining and processing industries, necessitating the development of a corresponding regional business environment management policy that takes into account the specifics of economic activity and entrepreneurial activity within a given region. Taking these regional characteristics into account allowed us to develop a pool of business management concepts that are most applicable to the integrated processing of mineral resources in the Arctic Zone of the Russian Federation. Thus, in fully Arctic regions, intensifying entrepreneurial activity is possible through internal outsourcing, the creation of technology parks with state participation, and the establishment of new business structures based on public-private partnerships. In partially Arctic regions, this can be achieved through the development of small and medium-sized mining businesses with state support. Business models corresponding to the identified concepts and specific tools for intensifying entrepreneurial activity, facilitating their practical implementation, are identified. In examining the practical application of the presented business models in relation to the problem of eliminating import dependence on strategic mineral raw materials, using the apatite-nepheline ores of the Khibiny deposits as an example, we concluded that their implementation is feasible, supported by the accumulated scientific knowledge in processing technologies, established trends in corporate management of production and business, as well as increasing demands for environmental safety and global geopolitical changes. Taking into account the priority objectives of developing the mineral resource base, related to organizing small-scale production of products in demand on the domestic market—inorganic sorbents, materials for electronics, titanium dioxide-based sealants, functional rare metal compounds, and rare metal powders for capacitor and other industries—we analyzed existing production processes for these products relative to the identified business models. Specific aspects of regulating the activities of subsoil users, including defining the mechanisms for their interaction, were identified, which urgently require further clarification and improvement. At the same time, it is necessary to strengthen the systematic nature of the decision taken on the SSR and SSF agreements and expand their application to the entire mineral resource base, clarify the purpose of such activities to ensure the solution of problems of minimizing the risks of import dependence on strategic types of mineral resources, the development of high-tech industries as consumers of mineral raw materials and environmental safety in the context of rational nature management. It is argued that improving systemic efficiency requires creating a mechanism for network interaction between economic entities in the mining and processing complex, implemented through a corresponding agreement. A diagram of how a mining and processing complex operates under a network interaction agreement is presented. The differences between a network interaction agreement and standard civil law contracts such as subcontracts, cooperation, leases, and sales contracts are discussed.

It was stated that in order to stimulate entrepreneurial activity. The creation of appropriate targeted government regulations is essential for businesses. To develop such regulations, an analysis of the external environment and an assessment of the readiness of economic entities in the mining and processing sector to implement the concept of integrated mineral resource processing were conducted.

Regulators are proposed, and risk indicators for a positive decision on the transition to the integrated processing of mineral resources by economic entities are identified. Key risk indicators include: a lack of regular customers with significant order volumes; a lack of interested partner companies willing to integrate into the existing technological process for the implementation of additional extraction and more in-depth integrated processing of mineral resources; low competitive advantages of the recovered valuable component compared to similar market competitors; a lack of government subsidies for costs, particularly in terms of conducting a feasibility study for the integrated processing of mineral resources; and the economic infeasibility of the existing technology for industrial development due to the aforementioned risks.

The identified risk indicators and the readiness of economic entities and the regional economic system

as a whole to transition to the CPMS concept form the basis for developing proposals and recommendations for subsequent stages of implementing the Strategy for the Development of the Mineral Resource Base of the Russian Federation until 2035, which makes it possible to formulate a new action plan planned for implementation from 2025 to 2030. Therefore, special attention was paid to clarifying the conditions for improving the management mechanisms for the development of Russia's mineral resource base, taking into account the specifics of regional economic activity in the Arctic. To this end, the nature, conditions, and results of the first stages of the Strategy's implementation were examined in detail. It was established that significant work was carried out during the implementation of the first stage of the Strategy to improve the legal framework, which provided a significant impetus for the development of geological exploration. At the same time, the plan approved within the Strategy for achieving the goal of sustainable mineral resource supply by increasing the investment attractiveness of geological exploration at all stages, improving the quality of forecasting and exploration for new deposits, and increasing the efficiency of developing known deposits, including undeveloped ones, through the implementation of modern technologies for processing, beneficiation, and integrated extraction of minerals, is not being fully implemented and is unbalanced. Thus, at the current stage of the Strategy's implementation, the greatest emphasis is placed on extensive methods, that is, improving the quality of forecasting and exploration for new deposits. This is evidenced by the Strategy's key indicators by which its effectiveness is assessed, namely, the increase in reserves of the most important minerals and the volume of extra-budgetary investments in geological exploration, which are being achieved quite successfully. However, the part related to increasing the efficiency of developing known deposits, including undeveloped ones, through the implementation of modern technologies for processing, beneficiation, and integrated extraction of minerals remains the least addressed. The result is the continued accumulation of mining waste, an increase in the volume of man-made deposits, and the involvement of large areas of land in production processes. The Strategy's methodological shortcomings have also been identified, namely:

1) there is no mechanism (methodology) for implementing, in principle, correctly formulated ideas, goals and objectives for choosing a strategy for the development of mineral resources;

2) The main focus is on the geological study of the subsoil and the assessment of the current state of the provision of explored reserves of various types of mineral raw materials, without taking into account the geological, technological, economic, natural and socio-economic conditions for the integrated development of deposits in the raw material regions of Russia.

It has been substantiated that, to fully implement the integrated processing of raw materials, it is necessary to legislate measures to stimulate the organization of mining production, eliminating waste generation and utilizing intermediate products in a closed-loop process for both primary and secondary production. However, our study of the current reality of the Russian subsoil use industry confirmed the inadequacy of legislative measures alone. It is necessary to increase the interest of existing economic entities—subsoil users—in such activities. This is due to the fact that, as we have found, in practice, subsoil users are more or less satisfied with the current state of affairs and are not prepared for the changes associated with the transition to the integrated processing of mineral resources. For example, it was found that the regional economic system of the Murmansk Region exhibits a relatively high level of resistance and a moderate level of readiness for changes associated with the transition to the integrated processing of mineral resources. Therefore, it is necessary to reduce the level of resistance to change and, where possible, increase the willingness of economic entities in the region to accept such changes.

An analysis of the resistance factors revealed that for the Murmansk region, as a region entirely within the Russian Federation's Arctic zone, intensification of entrepreneurial activity is possible through internal outsourcing, the creation of a technology park with state participation, and the establishment of new business structures based on public-private partnerships.

For the Khibiny deposits, the most promising ones will beBusiness models A "Involvement of economic entities in mining processes" (gaining access to deposits for organizing mining and primary processing) and B "Involvement of economic entities in processing processes" (creation of additional production stages to the existing technological process of producing concentrates at JSC Apatit and gaining access to process waste, which serves as raw materials for the next stage of production). The solution to the issue of transitioning to the implementation of the concept of integrated processing of mineral resources at the preparatory stage should be the fulfillment of a number of general conditions that can contain practical value both for all resource regions of Russia with a similar profile in terms of the level and type of entrepreneurial activity, and for specific ones, that is, characteristic only of the Murmansk Region. The following general conditions have been formulated, namely:

- ensuring the required level of demand;
- the need to develop marketing in the mining industry not only from the point of view of the use of potential raw materials as a component for the production of any product, but also in the geological aspect, allowing, when developing a feasibility study

for new deposits, to evaluate the current possibilities of extracting the same useful component by deploying the concept of integrated processing at existing production facilities and comparing the resulting economic, environmental and social effects for making a final decision;

- the creation of a logistics and distribution system through the establishment of a state management company that issues government contracts, collects consumer orders on the market, and redistributes completed government contracts for the integrated processing of mineral resources, in both small and large batches, as well as performing the function of searching for potential partners who could integrate into existing technological processes on an outsourcing basis;
- During the first stage, government support will subsidize costs associated with conducting feasibility studies, a high-risk and costly activity for economic entities. In addition to the above, special conditions will be created for the Murmansk Region to foster the development of small and medium-sized businesses within the regional economy, creating an optimal number of economic entities in service, auxiliary, and related processes related to mining and processing through the development of intra-corporate entrepreneurship (due to the predominant entrepreneurial activity of businesses), as well as addressing the labor shortage caused by the rapid population decline in the region in recent years. The proposed recommendations may form the basis for a new action plan for the period 2024 to 2035. for the implementation of the Strategy for the Development of the Mineral Resource Base of the Russian Federation until 2035, and the proposed approach, based on an assessment of entrepreneurial activity and determining the readiness of regional economic systems to transition to a new operating concept, may become the methodological basis for adjusting the Strategy, allowing for taking into account the specific features of the regional economies, their individual sectors, as well as the development plans of systemically important enterprises.

References:

1. Devyatkin, P. N. (2025). Natural water resources of the Monchegorsk region under the conditionsfunctioning of JSC Kola Mining and Metallurgical Company. *Bulletin of Moscow State Technical University.* Series: Natural Sciences. 2025. No. 3, v. 11 -- pp. 393-397.
2. Didyk, V. V. (2025). Regional investment policy in the North of Russia/ *Spatial Economy*. 2025. No. 4 -- pp. 90-101.
3. Emelyanova, E. E. (2024). Municipal expenditures and population incomes in the Russian Arctic/ *ECO*. 2024. No. 7 (541),- pp. 80-98.
4. Efimov, I. P. (2025). Personnel needs of the Russian Arctic economy: a look into the future / *Economic issues*.2025, No. 8,- pp. 118-132. DOI:10.32609/0042-8736-2025-8-118-132
5. Zamyatina, N. Yu. (2024). *Russian Arctic: towards a new understanding of development processes*/Moscow: Lenand, 2024,- 395 p.
6. Ivanova, M.V. (2025). Formation of a mechanism for interaction between socially responsible business and regional authorities in the Arctic zone of the Russian Federation. *Economic and social changes: facts, trends, forecast.* 2025. Vol. 13. No. 1 -- pp. 56-69. DOI:10.15838/esc.2025.1.67.3
7. (2025). *Innovative basis for the strategy of integrated development of mineral resources* / edited by Corresponding Member of the Russian Academy of Sciences V. L. Yakovlev. Yekaterinburg, Ural Branch of the Russian Academy of Sciences, 2025,- 360 p.
8. Kabanova, I.V. (2025). Socio-economic development of the Russian Federation (on the example of the city of Novy Urengoy). *Bulletin of the Moscow University named after S. Yu. Witte.* Series 1: Economics and Management. 2025. No. 4 (15) -- pp. 25-31.
9. Kazanin, O. I. (2024). Mining education in the 21st century: global challenges and prospects. *Zapiski Gornogo Instituta*. 2024. Vol. 2025,- pp. 369-375. DOI: 10.18454/PMI.2024.3.369.
10. Kalinin, M. O. (2025). *Analysis of the application of innovative materials for solvingProblems of safe construction in the Arctic / Arctic: modern approaches to industrial and environmental safety in the oil and gas sector*. Tyumen, 2025,- pp. 96-99.
11. Kalinnikov, V. T. (2024). *Integrated processing of apatite-nepheline ores: status and prospects*/ Integrated processing of apatite-nepheline ores. 2024,- pp. 5-15.
12. Kaplunov, D. R. (2024). Conditions for sustainable development of the mineral resource

complex of Russia / *Mining information and analytical bulletin* (scientific and technical journal). 2024. No. S1-1 -- pp. 3-11.

13. Karpov, V. P. (2025). Soviet historical experience of Arctic development in the mirror of modern problems. *Bulletin of Tomsk State University. History*. 2025. No. 63 -- pp. 25-30.
14. Klyukina, E. S. (2025). Environmental threats to population health in industrial areas of the Arctic region. *Proceedings of the Kola Science Center of the Russian Academy of Sciences*. 2025. Vol. 9, No. 2-13 -- pp. 91-103. DOI: 10.25702/KSC.2307-5252.2025.9.2.91-103

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Issue Article

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ON THE IMPORTANCE OF HUMAN CAPITAL AS A KEY ASSET IN THE ECONOMIC DEVELOPMENT OF ARCTIC TERRITORIES

Abstract: *In this article, the authors analyzed the demographic and socioeconomic situation in the Arctic zone of the Russian Federation. They examined prevailing demographic trends, key economic and social development indicators, the labor market situation in the regions of the Russian Arctic zone, challenges in providing the region with the necessary skilled labor, and selected public health indicators. Conclusions were drawn regarding the divergent demographic development vectors of Russia's northern territories, the prevalence of negative migration processes, and the need to preserve and further develop human capital, the size and quality of which are determined by the extent of investment in education and healthcare. Based on the results of this analysis, it can be concluded that to address the diverse and complex challenges of reviving the Russian Arctic, it is essential to preserve and further develop the region's human capital as the primary driver of innovative economic and social progress.*

Key words: *The Arctic zone of the Russian Federation, demography, socio-economic development, human capital, labor resources, education, healthcare, northern territories.*

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Introduction

In August 2025, the Russian Government approved a new version of the state program "Socioeconomic Development of the Arctic Zone of

the Russian Federation" (AZRF)—the key mechanism for implementing Russian Arctic policy, outlining its main goals, objectives, and strategic priorities. Implementing these goals will be impossible without preserving and developing the fundamental resource of the modern economy—people. The socioeconomic aspects and challenges of their lives are particularly evident in the Arctic expanses, which our country is developing not for the first time, but at a new stage of technological and organizational development. Enhanced economic activity in the region is a critical national objective, which can only be optimally achieved through the use of the latest technology and innovation. This requires coordinated efforts at the federal and regional levels, including the development and implementation of state programs for Russian Arctic entities. Therefore, an analysis and objective assessment of the region's human potential are essential and relevant. According to the modern development paradigm, investments in human capital yield higher dividends than investments in other factors of production.

The goal of implementing the State Program is to increase the level of socio-economic development in the Arctic Zone of the Russian Federation, and one of the main tasks is to improve the quality of life and security of the population against the backdrop of significant differences within and between polar regions, as well as between indigenous and non-indigenous populations, including in terms of demographic indicators.

Demographic profile.

Demographic potential is the basis of human capital, characterizing the reproduction of the population and determined by the indicators of natural and migration movement of the population, average life expectancy and their dynamics. Since 2025, the Arctic Zone of the Russian Federation has been identified as an independent object of statistical observation, the section "Indicators of the socio-economic development of the Arctic Zone of the Russian Federation and national security" has been included in the Federal Statistical Work Plan. Judging by the available data, in recent years there have been multidirectional trends and vectors of demographic development in the region. According to Rosstat, in 2024 the population of the Arctic Zone of the Russian Federation decreased by 6,579 thousand people (in 2015 by 13.4 thousand people) (Table 1), this happened in the majority of the studied subjects, the most in the Murmansk (-4,552 thousand) and Arkhangelsk regions (-2,112 thousand); The Yamalo-Nenets Autonomous Okrug (YNAO) demonstrated the most significant population growth (+1,945 thousand). The decrease in the total population occurred primarily due to negative net migration throughout the Arctic Zone of the Russian Federation (Table 2). The decline was particularly severe in the Murmansk and Arkhangelsk Oblasts, Krasnoyarsk Krai, and the Yamalo-Nenets Autonomous Okrug; the Sakha Republic (Yakutia), Chukotka Autonomous Okrug (ChAO), and Nenets Autonomous Okrug (NAO) suffered the least in this regard.

Table 1. The permanent population of the land territories of the Arctic Zone of the Russian Federation as of January 1 (people)

Territories	2024	2025	Territories	2024	2025
Arctic Zone of the Russian Federation	**2,378,234**	**2,371,655**	UrbanNovaya Zemlya District	3,024	2,934
Komi Republic	81,442	80,061	Novodvinsk urban district	38906	38,735
Vorkuta urban district	81,442	80,061	Severodvinsk urban district	186 138	185,042
Republic of Sakha (Yakutia)	26 107	26,190	Mezensky municipal district	9 241	9,049
Allaikhovsky municipality burning area	2,682	2,718	Onega municipal district	31,456	30,762
Anabar national (Dolgano-Evenki) municipality burning area	3,431	3,500	Primorsky municipal district	25,787	25,639
Bulunsky municipal-district	8,366	8,404	Murmansk Oblast	762 173	757 621
Nizhnekolymsky municipal-central district	4,386	4,366	NAO	43,838	43,937

Ustyansky municipal-district	7 242	7 202	ChAO	50 157	49,822
Krasnoyarsk Krai	227,546	227 220	Yamalo-Nenets Autonomous Okrug	534 104	536,049
Norilsk urban district	178 106	178,654	Republic of Karelia6	27809	27267
Taimyr Dolgano-Nenets municipality district	32,871	32,290	Belomorsky municipal district	17,034	16,663
Turukhansky municipal district	16,569	16,276	Loukhsky municipal district	12,056	11,771
Arkhangelsk Oblast without the Nenets Autonomous Okrug	652 867	650 755	Kemsky municipal district	15,753	15,496
Urban district "Arkhan-Gelsk	358 315	358,594			

In most Arctic Zone regions, the birth rate exceeded the death rate in 2024 (Table 2), with the Nenets Autonomous Okrug, the Sakha Republic (Yakutia), and the Yamalo-Nenets Autonomous Okrug ranking 3rd, 8th, and 11th in the Russian Federation in terms of birth rate, respectively. The demographic dependency ratio in the Arctic Zone regions did not exceed the Russian average—764 people aged 0–15 and 60 years and older per 1,000 people of working age, with the exception of the Arkhangelsk Region, excluding the Nenets Autonomous Okrug.

Table 2. Demographic indicators of the Arctic Zone of the Russian Federation subjects in 2024

Territories	Natural coefficient Population growth	Migration growth rate	Demographic dependency ratio	Migration increase, people
Arctic Zone of the Russian Federation	3.1	-5.9	..	-14021
Komi Republic*	0.9	-18.0	725	-1451
Sakha Republic (Yakutia)	7.0	-3.8	701	-99
Krasnoyarsk Krai	7.3	-8.8	726	-1990
Arkhangelsk Oblast without the Nenets Autonomous Okrug	-0.5	-2.8	812	-1811
Murmansk Oblast	-0.3	-5.7	674	-4343
NAO	9.6	-7.3	736	-320
ChAO	3.6	-1.0	582	-516
Yamalo-Nenets Autonomous Okrug	10.1	-69.8	536	-3491
Republic Karelia*	-2.8	-16.0	811	..

In the Arctic Zone of the Russian Federation, life expectancy at birth has generally increased in recent years, in line with the national positive trend, and in 2024 it amounted to 71.36 years, but was lower than the national average (71.87 years). This level was exceeded only in the Yamalo-Nenets Autonomous Okrug (72.13 years), with a similar figure in the Nenets Autonomous Okrug (71.08), while the largest lag, as in the previous period (2014–2015), was demonstrated by the Chukotka Autonomous Okrug (64.42 years), which ranks second from the bottom among Russian regions after the Republic of Tyva. This figure is also low in the Republic of Karelia (69.78 years). The average age of residents in the Arctic Zone of the Russian Federation is lower than the national average (40.7 years), with the exception

of the Chukotka Autonomous Okrug (41.5 years), and the proportion of children and individuals of working age is higher (except for the Arkhangelsk Region, in the latter case).

Low life expectancy and depopulation in the Russian North, which have been observed in recent decades and which reduce the region's demographic security, are associated not only with extremely harsh natural and climatic conditions, which lead to high morbidity and mortality rates, but also with a low quality of life due to the insufficient development of the healthcare system, including the availability of high-quality medical services.

Standard and quality of life

Standard of living refers primarily to income; quality of life also includes longevity and educational attainment as generalized health characteristics, objective indicators of the quality of medical and educational services, and the implementation of national programs in the relevant areas. Gross regional product (GRP) is a key indicator of socio-economic development; in per capita terms, it is higher than the Russian average in all territories of the Arctic Zone of the Russian Federation, except for the Arkhangelsk Region without the Nenets Autonomous Okrug. The leaders are the Nenets Autonomous Okrug, Yamalo-Nenets Autonomous Okrug, and Chukotka Autonomous Okrug, where this indicator exceeds the average for the constituent entities of the Russian Federation by 11.2, 7.6, and 2.9 times, respectively. The share of GRP produced in the Arctic Zone of the Russian Federation in the total GRP of the constituent entities of the Russian Federation is steadily growing: from 2022 to 2024, it increased by 0.3% to 5.3%. The share of the added value of high-tech and knowledge-intensive sectors of the economy in the GRP of the Arctic Zone of the Russian Federation reached 7.1%, while the share of knowledge-intensive innovative goods and services decreased during the same period. Per capita income of the population, due to regional coefficients and wage supplements for work in the Far North regions, is higher in the Arctic Zone of the Russian Federation than the Russian average, with the exception of Krasnoyarsk Krai, where the sectoral structure of gross added value is dominated by manufacturing rather than mining (Table 3). At the same time, the share of the population with incomes below the subsistence minimum established in the constituent entity of the Russian Federation exceeds the Russian average (13.4%) in the Komi Republic (16.7%), Arkhangelsk Oblast excluding the Nenets Autonomous Okrug (14.3%), Krasnoyarsk Krai (18.4%) and the Sakha Republic (Yakutia) (19.8%). The problems of low income in northern regions threaten to undermine the achievement of a range of state Arctic policy objectives. The Gini coefficient exceeds the national average (0.412) in the Nenets and Yamalo-Nenets Autonomous Okrugs. Overall unemployment is significantly lower than the national average in the Yamalo-Nenets and Chukotka Autonomous Okrugs, which are among the country's leaders in labor force participation and employment rates.

Table 3. Social and economic indicators of the Arctic Zone of the Russian Federation subjects, 2024

	Graduation of skilled workers and employees / mid-level / senior specialists, thousand people.	Morbidity, people per 1000 people population	Average per capita cash income per month, rubles.	Employment rate, %	Unemployment rate, %
Russian Federation	198.6/469.1/1161.1	785.3	30744	65.7	5.5
Komi Republic	1.9/ 2.9 / 4.8	1121.2	31527	64.6	8.7
Arkhangelsk Oblast without the Nenets Autonomous Okrug	2.6 / 3.5 / 5.8	1002.2	31043	61.7	7.1
NAO	0.1 / 0.2 / ..	1380.7	69956	67.1	8.5
Murmansk Oblast	1.0/ 2.4 / 3.2	875.8	36115	68.8	7.7
Yamalo-Nenets Autonomous Okrug	0.8/ 1.6 / 0.2	1180.4	67521	75.1	2.6
Krasnoyarsk Krai	4.2/ 9.5 / 18.9	783.1	28030	64.3	6.1
Republic of Sakha (Yakutia)	2.4/ 4.1 / 4.7	1043.8	38933	64.5	7.2
ChAO	-/ 0.1 / 0.1	1289.4	63909	79.6	3.5
Republic of Karelia	1.0 / 2.2 / 3.0	1126.2	25744	62.2	9.2

The real sector of the Russian Arctic economy is primarily represented by the defense industry, mining, and enterprises related to transport infrastructure and the Northern Sea Route. In the sectoral structure of gross value added, mineral extraction ranks first everywhere except in Krasnoyarsk Krai; the share of manufacturing is also high in the Komi Republic, Arkhangelsk Oblast, and Murmansk Oblast.

During the new development of the Arctic Zone of the Russian Federation, the system of secondary, higher, and continuing education for adults will play a central role in the formation of human capital, allowing future specialists to master blue-collar jobs during the intermediate stage of training. However, in line with the national trend, the region currently produces predominantly specialists with higher education (Table 3). The composition of the employed population in the Arctic by level of vocational education in 2024 was as follows: the highest share of the employed population with higher education was in the Yamalo-Nenets Autonomous Okrug (41.2% versus the Russian average of 33.5%), and the lowest was in the Komi Republic (25.8%). Arkhangelsk Oblast, excluding the Nenets Autonomous Okrug, leads in secondary vocational education of the workforce (56.3%), followed by the Nenets Autonomous Okrug (54.8%), and the Chukotka Autonomous Okrug (36.0%), which is almost 10% lower than the Russian average (45.1%). The highest share of unemployed people with university education is in the Yamalo-Nenets Autonomous Okrug (26.0% versus the Russian Federation average of 20.5%), and the lowest is in the Nenets Autonomous Okrug (4.3%). In order to create a modern educational, scientific, and innovative infrastructure, strengthen regional educational institutions and their ties with the economy and social sphere, and develop a competitive human resource potential corresponding to the objectives of resuming full-fledged economic activity in the Russian Arctic, the following federal universities operate in the field of higher education: Siberian (Krasnoyarsk), Northern (Arctic) University named after M.V. Lomonosov (Arkhangelsk), Far Eastern (Vladivostok), and North-Eastern University named after M.K. Ammosov (Yakutsk). In April 2025, Murmansk Arctic State University, the largest higher education institution in the region, became one of the regional flagship universities. Its mission is to accumulate regional, domestic, and international scientific and educational potential to effectively support the development of the Arctic Zone of the Russian Federation in terms of human resources and scientific research. The flagship universities have a total of approximately 20 branches and include institutes and colleges, thus ensuring not only continuous but also accessible education for residents of various categories of settlements.

Arctic universities are increasing the number of students admitted to state-funded places, with engineering programs accounting for the majority of these, generally higher than the national average. However, approximately 20% of graduates find employment outside the Arctic Zone of the Russian Federation, and expanding cooperation between universities and businesses in the training and subsequent employment of graduates is a pressing issue. The region's largest employers are currently experiencing a shortage of qualified CNC machine operators, lathe operators, milling machine operators, and electric welders. There is an objective need to train specialists in shipbuilding, mechanical engineering, and instrument engineering, shipbuilding economics and management, and other fields. Targeted training (in specialties and areas of training identified by the state or leading regional employers), along with additional vocational education and advanced training, can address the Arctic's most pressing human capital needs. Health is the most pressing issue in human capital development in the Arctic Zone of the Russian Federation. Health indicators in the Arctic are inferior to those in Russia as a whole: life expectancy in the region is lower (53 years, according to some expert estimates), and morbidity rates, especially for parasitic and cancerous diseases, are significantly higher (with the exception of Krasnoyarsk Krai). This highlights the need to train medical personnel for the Arctic with these specific needs in mind. There is also a pressing need to develop pharmacological therapies for thermal management that could increase survival rates when exposed to low temperatures, as well as vaccines against infections that existed tens of thousands of years ago, as the permafrost thaws.

In 2024, in accordance with an order from the Russian Ministry of Health, the Arctic Scientific and Educational Cluster of federal healthcare institutions was established to improve the quality of medical personnel training for polar regions. It includes I.I. Mechnikov Northwestern State University (St. Petersburg) and Northern State Medical University (Arkhangelsk). The Northern Cluster specializes in Arctic medicine, and its main objective is to improve the quality of personnel training and the efficiency of universities, as well as develop research activities. Increased student and faculty mobility is also planned. Improving healthcare requires accelerated development of mobile and satellite communications, expanding the fleet of medical helicopters, and upgrading medical infrastructure. These measures, along with improved disease prevention and the promotion of a healthy lifestyle, can significantly improve the health of northerners.

Conclusion

Today, Russia occupies a global leadership position in the development of Arctic projects: infrastructure (the Northern Sea Route, road, air, and rail routes), oil and gas, mining (the Bovanenkovo-

Ukhta-Torzhok gas pipeline, etc.), industrial (shipbuilding and mechanical engineering), and information technology. The territory of the Russian Arctic will continue to grow: the authorities of Karelia have justified the inclusion of two territorial units (the Segezha District and the city of Kostomuksha) in the Arctic Zone of the Russian Federation. Russia's revenue from the exploitation of Arctic resources is also gradually increasing: LNG exports in the first quarter of 2025, compared to the same period in 2024, more than doubled in real terms and increased almost 2.5 times in value, with a significant portion of this growth coming from the Yamal Liquefied Natural Gas Plant (Yamal LNG). Also in Yamal (and in Greenland), scientists from the Ural Branch of the Russian Academy of Sciences, together with the French Academy of Sciences, will carry out a project to conduct a large-scale study of the impact of climate change on Arctic fauna in order to preserve biodiversity in the Arctic.

Given the harsh meteorological and geophysical conditions, the challenging environmental situation in high-latitude territories, and the impact of Western sanctions, the implementation of economic and infrastructure projects in the Arctic during this new phase of its development will be determined by the potential of domestic science and industry and their ability to create competitive products. In turn, the realization of these opportunities is closely linked to the quantity and quality of human potential, whose development index, according to the UN Development Programme, is below the Russian average in most regions of the Arctic Zone. The utilization of all other development resources depends on human capital; without healthy, educated people provided with decent work, it will be impossible to develop the real sectors of the economy in the Arctic. This means measures must be taken to stabilize the demographic situation, increase the attractiveness of the region as a place of permanent residence, and develop indigenous social innovation technologies, including in medicine and education.

An analysis of human development data in the Arctic reveals diverse processes: one key trend is increased migration and, consequently, population decline in many regions, despite a higher natural population growth rate than in the Russian Federation as a whole. Data on socioeconomic development also paints a mixed picture: on the one hand, high nominal incomes, their relatively even distribution, and a high employment rate with low unemployment; on the other, a shortage of specialists at various levels of professional training for the region's economy and social sphere. Given the above, it can be concluded that a reversal of the negative trends in sociodemographic development is likely. This, given the challenging natural and climatic conditions and significant territorial disparities, is only possible through improving well-being and quality of life, improving the environment, promoting the development of traditional activities, and creating optimal conditions for the personal and professional fulfillment of northerners.

References:

1. Sinitsa A.L. (2024). Birth rate in the European North of Russia in 1990-2025. *Arctic and North*. 2024, No. 27 - pp. 14-23. DOI: 10.17238/issn2221-2698.2024.27.5
2. Lukin Yu.F. (2025). *Multidimensionality of the Arctic space.* Arkhangelsk: NArFU named after M.V. Lomonosov, 2025, 251 p.
3. Sukneva S.A. (2024). *Population and ethno-demographic processes in the Russian Arctic* / Arkhangelsk: NArFU named after M.V. Lomonosov, 2024, pp. 97-98.
4. Gontmakher E. (2025). *Russian human capital: state and trends*/2025. No. 3, v. 61 - pp. 15-24. DOI: 10.20542/0131-2227-2025-61-3-15-24.
5. Govorova N.V. (2024). Human and competitive potential of the Arctic. *Modern Europe*. 2024. No. 4 - pp. 62-70.
6. Vedeneyeva V. (2025). The role of education in the concept of innovative development of the economy. *World Economy and International Relations*, 2025. No. 4 - pp. 68-80.
7. (2011). *Human Development Report for the Russian Federation 2011. Modernization and Development of Human Potential*. Moscow, 2011. pp. 306-307.
8. Govorova N.V. (2013). Arctic powers: development of human potential (comparative characteristics). *Modern Europe*. 2013. No. 4. pp. 37-45.
9. Devyatkin, P. N (2024). Natural water resources of the Monchegorsk region under the conditionsfunctioning of JSC Kola Mining and Metallurgical Company. *Bulletin of Moscow State Technical University.* Series: Natural Sciences. 2024. No. 3, v. 11, pp. 393-397.
10. Didyk, V. V., & Serova, N. A. (2025). Regional investment policy in the North of Russia. *Spatial Economy*. 2025. No. 4, pp. 90-101.

11. Emelyanova, E. E. (2025). Municipal expenditures and population incomes of the Russian Arctic / *ECO*: 2025. No. 7 (541), pp. 80-98.

12. Efimov, I. P. (2025). Personnel needs of the Russian Arctic economy: a look into the future / *Economic issues*.2025, No. 8, pp. 118-132. DOI:10.32609/0042-8736-2025-8-118-132

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